

Instruction Manual HFID

Heated Flame Ionization Detector

NGA 2000 Hardware Manual for HFID Analyzer Module (combined with NGA 2000 Platform, MLT, CAT 200 or TFID Analyzer) 1st Edition 09/2008



ESSENTIAL INSTRUCTIONS

READ THIS PAGE BEFORE PROCEEDING!

Emerson Process Management (Rosemount Analytical) designs, manufactures and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you **MUST properly install, use, and maintain them** to ensure they continue to operate within their normal specifications. The following instructions **MUST be adhered to** and integrated into your safety program when installing, using and maintaining Emerson Process Management (Rosemount Analytical) products. Failure to follow the proper instructions may cause any one of the following situations to occur: Loss of life; personal injury; property damage; damage to this instrument; and warranty invalidation.

- **Read all instructions** prior to installing, operating, and servicing the product.
- If you do not understand any of the instructions, **contact your Emerson Process Management (Rosemount Analytical) representative** for clarification.
- **Follow all warnings, cautions, and instructions** marked on and supplied with the product.
- **Inform and educate your personnel in the proper installation, operation, and maintenance of the product.**
- **Install your equipment as specified in the Installation Instructions of the appropriate Instruction Manual and per applicable local and national codes.** Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, **use qualified personnel** to install, operate, update, program, and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Emerson Process Management (Rosemount Analytical). Unauthorized parts and procedures can affect the product's performance, place the safe operation of your process at risk, **and VOID YOUR WARRANTY.** Look-alike substitutions may result in fire, electrical hazards, or improper operation.
- **Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.**

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1st Edition: 09/2008

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PREFACE

The purpose of this manual is to provide information concerning the components, functions, installation and maintenance of the NGA 2000 HFID and the System Accessories of the NGA 2000 System.

Some sections may describe equipment not used in your configuration. The user should become thoroughly familiar with the operation of this module before operating it. Read this instruction manual completely.

DEFINITIONS

The following definitions apply to WARNINGS, CAUTIONS and NOTES found throughout this publication.

WARNING

**Highlights on operation or maintenance procedure, practice, condition, statement, etc.
If not strictly observed, could result in injury, death, or long-term health hazards of personnel.**

CAUTION

**Highlights on operation or maintenance procedure, practice, condition, statement, etc.
If not strictly observed, could result in damage to or destruction of equipment, or loss of effectiveness.**




NOTE

Highlights an essential operating procedure, condition or statement.

IMPORTANT

SAFETY INSTRUCTIONS WIRING AND INSTALLATION OF THIS APPARATUS

The following safety instructions apply specifically to all EU member states. They should be strictly adhered to in order to assure compliance with the Low Voltage Directive. Non-EU states should also comply with the following unless superseded by local or National Standards.

1. Suitable grounding connections should be made at all connectors provided for this purpose.
2. All safety covers and grounding connections must be properly reinstated after maintenance work or trouble-shooting. The integrity of all earth terminals must be maintained at all times.
3. To ensure safe operation of this equipment, connection to the mains supply should only be made through a circuit breaker which will disconnect all circuits carrying conductors during a fault situation. The circuit breaker may also include a mechanically operated isolating switch. Circuit breakers or switches must comply with a recognized standard such as IEC947. All wiring must conform with any local standards.
4. Where equipment or covers are marked with the symbol to the right, hazardous voltages are likely to be present beneath. These covers should only be removed when power is removed from the equipment — and then by trained service personnel only. 
5. Where equipment or covers are marked with the symbol to the right, there is a danger from hot surfaces beneath. These covers should only be removed by trained service personnel when power is removed from the equipment. Certain surfaces may remain hot to the touch. 
6. Where equipment or covers are marked with the symbol to the right, refer to the Instruction Manual for instructions. 
7. Further graphical symbols used in this product:



Elektrostatic discharge (ESD)



Explosion Hazard!



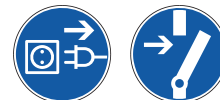
Flammable!



Harmful (to Health)!



Toxic!



Disconnect from Mains!

All graphical symbols used in this product are from one or more of the following standards:
EN61010-1, IEC417, and ISO3864.

OPERATING AND MAINTAINING THIS APPARATUS

On leaving our factory, this instrument conformed to all applicable safety directives.

In order to preserve this state of affairs, the operator must take care to strictly follow all the instructions and notes given in this manual and on the unit.

Before switching on the instrument, ensure that the local nominal mains voltage corresponds to the factory-set operational voltage of this unit.

Any interruption of the protective earth connections, whether inside or outside of the unit, or removal or interruption of its ground line connection, may result in exposure to the risk of electricity. Deliberately disconnected the protective earth is therefore strictly forbidden.

Removing covers and opening panels may expose components conducting electric current. Connectors may also be energized. The unit therefore should be disconnected from all electrical supplies before any kinds of maintenance, repair or calibration work requiring access to the inside of the unit. Only trained personnel who are aware of the risk involved may work on an open and energized unit!

Fuses may only be replaced by fuses of an identical type and with identical ratings. It is forbidden to use repaired fuses or to bypass fuses.

Take note of all applicable regulations when using this unit with an autotransformer or a variable transformer.

Substances hazardous to health may escape from the unit's gas outlet.

Please pay attention to the safety of your operation personnel. Protective measures must be taken, if required.

NOTE

Software compatibility is necessary for all NGA 2000 components in your system to work together. The version of your Platform's software must be equal to or greater than the version of any other module(s) for successful compatibility.

You can locate the version of each NGA 2000 component as follows:

Platform Controller Board

Turn power ON. The display should show „Control Module V3. ...“. This is the software version.

Analyzer Module

See note on the name plate label located on the right side of the Analyzer Module case.

GENERAL SAFETY NOTICE / RESIDUAL RISK

If this equipment is used in a manner not specified in these instructions, protective systems may be impaired.

Despite of incoming goods inspections, production control, routine tests and application of state-of-the-art measuring and test methods, an element of risk remains when operating a gas analyzer!

Even when operated as intended and observing all applicable safety instructions some residual risks remain, including, but not limited to, the following:

- An interruption of the protective earth line, e.g. in an extension cable, may result in risk to the user.
- Live parts are accessible when operating the instrument with doors open or covers removed.
- The emission of gases hazardous to health may even be possible when all gas connections have been correctly made.

Avoid exposure to the dangers of these residual risks by taking particular care when installing, operating, maintaining and servicing the analyzer.

AUTHORIZED PERSONNEL

In-depth specialist knowledge is an absolutely necessary condition for working with and on the unit.

Authorized personnel for installing, operating, servicing and maintaining the analyzer are instructed and trained qualified personnel of the operating company and the manufacturer.

It is the responsibility of the operating company to

- train staff,
- observe safety regulations,
- follow the instruction manual.

Operators must

- have been trained,
- have read and understood all relevant sections of the instruction manual before commencing work,
- know the safety mechanisms and regulations.

To avoid personal injury and loss of property, do not install, operate, maintain or service this instrument before reading and understanding this instruction manual and receiving appropriate training. Save these instructions.



WARNING

ELECTRICAL SHOCK HAZARD

Do not operate without covers secure. Do not open while energized. Installation and/or servicing requires access to live parts which can cause death or serious injury.

Refer servicing to qualified personnel.

For safety and proper performance this instrument must be connected to a properly grounded three-wire source of power.



WARNING

POSSIBLE EXPLOSION HAZARD

This equipment is used in the analysis of sample gases which may be flammable, and the burner fuel used in the ionization process is flammable. A continuous dilution purge system is factory-installed and it must be functional at all times during operation. Do not disable this purge system.



WARNING

POSSIBLE EXPLOSION HAZARD

Protection against explosion depends upon a special fuel flow restrictor in the fuel inlet fitting. Do not remove fuel inlet restrictor. Use the correct fuel flow restrictor for the fuel being used. Replace only with factory applied fitting.



WARNING

POSSIBLE EXPLOSION HAZARD

Ensure that all gas connections are made as labeled and described within this manual and leak free. Improper gas connections may cause explosion, serious injury or death.



WARNING

FLAMMABLE SAMPLES

The internal compartment of the oven is vented to the main enclosure by the top and bottom vents. DO NOT RESTRICT THOSE VENTS. Consult the factory if flammable samples will be measured.



WARNING

HIGH TEMPERATURES

This equipment is used in the analysis of sample gases at temperatures of up to 250°C. All components and material in contact with the sample, the oven and the burner can reach this temperature level.

Operate this equipment only when covers are secured. Servicing requires access to "hot" parts which can cause serious injury. Refer servicing to qualified personnel.



WARNING

HIGH TEMPERATURES

The Sample In, Byass Out and Burner Exhaust Out connections can reach temperatures of up to 250 °C (480 °F). Severe burns could result from touching these connections.

WARNING

UNAUTHORIZED SUBSTITUTION OF COMPONENTS

Tampering with or unauthorized substitution of components may adversely affect the safety of this instrument. Use only factory documented/approved components for repair.

Because of the danger of introducing additional hazards, do not perform any unauthorized modification to this instrument!

NOTE

This Analyzer Module is completely leak-tested at the factory for gas leakage. The user is responsible for testing for leakage at the inlet and outlet fittings on the rear panel. The user is also responsible for leak-testing periodically and if any internal pneumatic components are adjusted or replaced.

WARNING

OVERBALANCE HAZARD

This analyzer module may tip instrument over if it is pulled out too far and the Platform is not properly supported.

CAUTION

POSSIBLE INSTRUMENT DAMAGE

Do not interchange gas inlets and outlet! All gases must be conditioned before supplying!
When supplying corrosive gases ensure that gas path components are not affected!

Exhaust lines must be installed in a descending way, need to be pressureless, frost-protected and in compliance with applicable legislative requirements!

WARNING



HAZARDS BY SAMPLE GAS COMPONENTS!

Before opening gas paths they must be purged with ambient air or neutral gas (N₂) to avoid hazards caused by toxic, flammable, explosive or harmful to health sample gas components!

CAUTION

PURGE AIR REQUIREMENT

This Analyzer Module must be used in conjunction with a device (Control Module or PC Interface) that can actively monitor network variables related to pressure or flow of the continuous dilution purge, or the front panel LEDs of the Analyzer Module, as installed, must be visible. The purpose of this requirement is to maintain adherence to ANSI/NFPA 496 standard which assures the continued viability of the purge system. Under no circumstances should any pressure or flow indicator be connected to the PURGE AIR OUT outlet of the Analyzer Module because this may affect the sealing performance of the module.

CAUTION

PRESSURIZED ENCLOSURE

This enclosure shall not be opened unless the area is known to be free of flammable materials or unless all devices within have been de-energized. Area classification for the protected enclosure:

Nonclassified.

Pressurization: Type Z

Temperature Identification Number: T4A

Power shall not be restored after enclosure has been opened (or loss of purge) until enclosure has been purged for a minimum of 6 (six) minutes at the minimum pressure of 689 hPa (10 psig).

GASES AND GAS CONDITIONING (SAMPLE HANDLING)



WARNING

GAS SAFETY

Take care of the safety instructions applicable for the gases (sample gases, test gases and fuel gas)!

CAUTION

PRESSURIZED GAS

This module requires periodic use of pressurized gas. See General Precautions for Handling and Storing High Pressure Gas Cylinders, page P-11.



WARNING

POSSIBLE EXPLOSION HAZARD

Do not use 100% hydrogen fuel in a 40% H₂ / 60% He configured Analyzer Module. An explosion resulting in severe personal injury or death could occur.

POWER SUPPLY

CAUTION



ELECTRICAL HAZARD

Verify the power voltage at site of installation corresponds to the analyzer module's rated voltage as given on the nameplate label!

Verify the safety instruction given by power supply unit manufacturer !

CAUTION



ELECTRICAL HAZARD

**The mains socket has to be nearby the power supply unit and easily accessible!
Disconnecting from power requires unplugging the power connector!**

To comply with the CE mark requirements use only power supply units of type SL5, SL10 or equivalent units. Equivalent units must provide SELV output voltages!

Verify proper polarity when connecting DC 24 V operated analyzer modules !

ELECTROSTATIC DISCHARGE

CAUTION

ELECTROSTATIC DISCHARGE



The electronic parts of the Analyzer Module can be irreparably damaged if exposed to electrostatic discharge (ESD).

The instrument is ESD protected when the covers have been secured and safety precautions observed. When the housing is open, the internal components are not ESD

Although the electronic parts are reasonable safe to handle, you should be aware of the following considerations:

Best ESD example is when you walked across a carpet and then touched an electrical grounded metal doorknob. The tiny spark which has jumped is the result of electrostatic discharge (ESD).

You prevent ESD by doing the following:

Remove the charge from your body before opening the housing and maintain during work with opened housing, that no electrostatic charge can be built up.

Ideally you are opening the housing and working at an ESD - protecting workstation. Here you can wear a wrist trap.

However, if you do not have such a workstation, be sure to do the following procedure exactly:

Discharge the electric charge from your body. Do this by touching a device that is grounded electrically (any device that has a three - prong plug is grounded electrically when it is plugged into a power receptacle).

This should be done several times during the operation with opened housing (especially after leaving the service site because the movement on a low conducting floors or in the air might cause additional ESDs).

GENERAL PRECAUTIONS FOR HANDLING AND STORING HIGH PRESSURE GAS CYLINDERS

Edited from selected paragraphs of the Compressed Gas Association's „Handbook of Compressed Gases“ published in 1981.

Compressed Gas Association

1235 Jefferson Davis Highway

Arlington, Virginia 22202

Used by Permission

1. Never drop cylinders or permit them to strike each other violently.
2. Cylinders may be stored in the open, but in such cases, should be protected against extremes of weather and, to prevent rusting, from the dampness of the ground. Cylinders should be stored in the shade when located in areas where extreme temperatures are prevalent.
3. The valve protection cap should be left on each cylinder until it has been secured against a wall or bench, or placed in a cylinder stand, and is ready to be used.
4. Avoid dragging, rolling, or sliding cylinders, even for a short distance; they should be moved by using a suitable hand-truck.
5. Never tamper with safety devices in valves or cylinders.
6. Do not store full and empty cylinders together. Serious suckback can occur when an empty cylinder is attached to a pressurized system.
7. No part of cylinder should be subjected to a temperature higher than 52 °C (125 °F). A flame should never be permitted to come in contact with any part of a compressed gas cylinder.
8. Do not place cylinders where they may become part of an electric circuit. When electric arc welding, precautions must be taken to prevent striking an arc against the cylinder.

DOCUMENTATION

The following HFID instruction materials are available. Contact Customer Service Center or the local representative to order.

HAS64E-IM-HW	Instruction Manual NGA 2000 HFID (this document)
90002496	Instruction Manual NGA 2000 Platform

COMPLIANCES

This product may carry approvals from several certifying agencies, including the Canadian Standards Association* (which is also an OSHA accredited, Nationally Recognized Testing Laboratory), for use in non-hazardous, indoor locations.



Emerson Process Management has satisfied all obligations from the European Legislation to harmonize the product requirements in Europe.



This product complies with the standard level of NAMUR EMC. Recommendation (May 1993).

NAMUR

This product satisfies all obligations of all relevant standards of the EMC framework in Australia and New Zealand.



GLOSSARY OF TERMS

Analyzer Module

The module that contains all sensor/detector components for development of a Primary Variable signal; includes all signal conditioning and temperature control circuitry.

Backplane

The interconnect circuit board which the Controller Board, Power Supply, Analyzer Module power and network cables, I/O Modules and Expansion Modules plug into.

Control Module

The Operator Interface plus the Controller Board.

Controller Board

The computer board that serves as the Network Manager and operate the Display and Keypad.

Distribution Assembly

The Backplane and the card cages that hold I/O and Expansion Modules.

I/O Module

A circuit board that plugs into the Backplane from the rear of the Platform. Has a connector terminal for communication with external data acquisition devices and provides an input/output function.

Power Supply

Any of a variety of components that provides conditioned power to other NGA 2000 components, from the Power Supply Board that plugs into the front of the Backplane in a stand-alone instrument to several larger ones that can power larger collections of modules and components.

Primary Variable

The measured species concentration value from an Analyzer Module.

Secondary Variable

Data placed on the network by a module regarding current status, e.g., sample flow, temperature and pressure.

Softkeys

The five function softkeys located below the front panel display; they assume the function displayed directly above each on the display, a function dictated by software.

System

Any collection of Analyzer Module(s), Platform(s) and I/O Module(s).

ANALYZER SYSTEM ARCHITECTURE

The NGA 2000 HFID is available as a "stand-alone analyzer" or as a "blind" Analyzer Module (AM). The HFID analyzer module can be part of the stand-alone analyzer or a component of an analyzers system (Fig. A-1).

The NGA 2000 system made it possible, to configure the HFID as a flexible "stand-alone analyzer" consisting of a HFID "Analyzer Module", a Platform (complete with front panel display/operator interface), and input/output (I/O) modules.

The "analyzer module" is a "blind" analysis unit but retains all the advanced design features. The AM variant is designed for integration as part of a NGA 2000 analysis system or special customer developed networks.

The platform/MLT's front panel can act as operator interface for a stand-alone analyzer or as the a central interface for multiple Analyzer Modules. In multi analyzer systems, this feature eliminates duplication of the display/operator interface. In addition to the obvious operational benefits there are significant cost and system packaging advantages not possible with conventional analyser configurations.

This flexible network communication architecture is shown in the schematic of Fig. A-2.

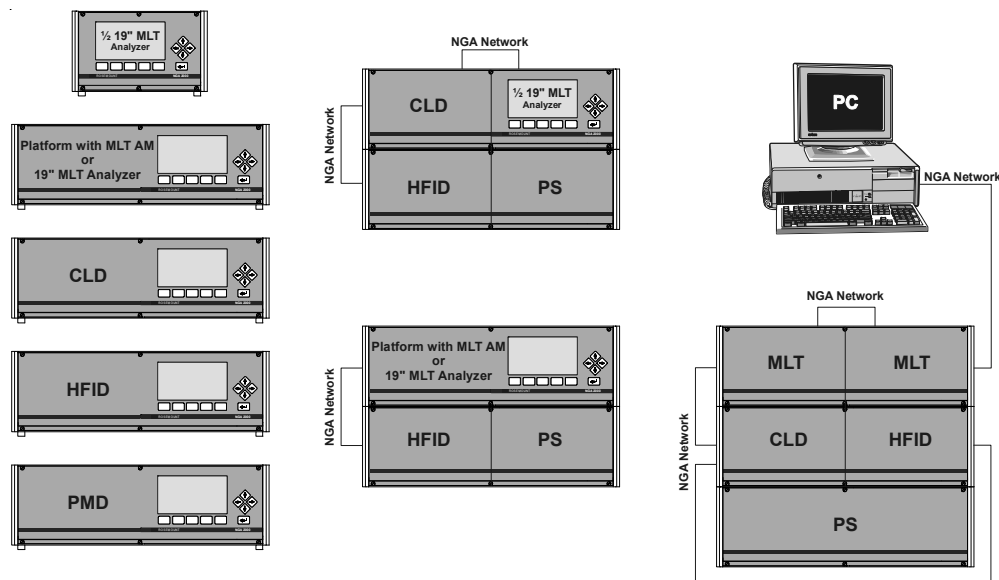


Figure A-1: From separate analyzers to analyzer system

The modular configurable bi-directional network offers the following options:

- ❑ Stand-alone analyzers (Single devices)
 - analyzer modules in a platform including optional inputs and outputs (SIO/DIO).

- ❑ Simple interconnection of analyzer modules to an analyzer system based on one of the three structures - see below.

These structures can be distinguished by acting of the host

- with platform as host including system inputs and outputs (SIO/DIO)
- with MLT/TFID/CAT 200 analyzer as controller including system inputs and outputs (SIO/DIO)
- with customer owned specific control units (not described in this manual, consult factory)

For combination possibilities of NGA 2000 I/O's see table A-1.

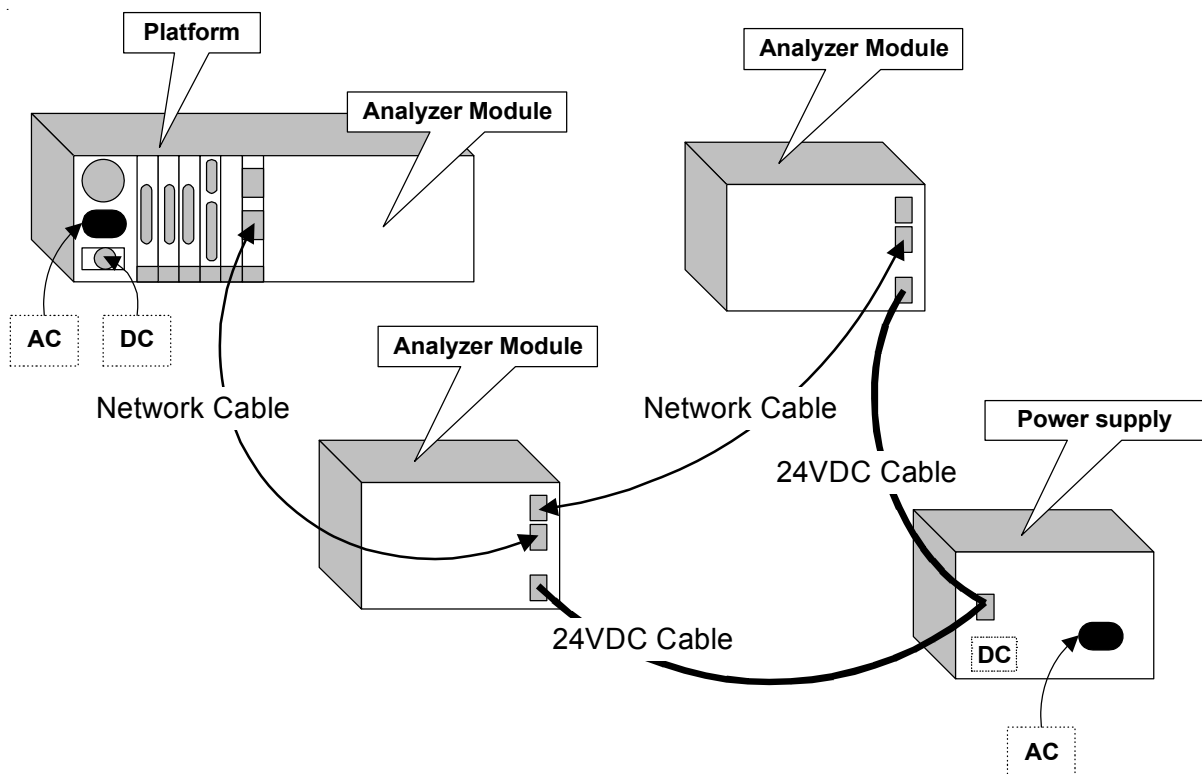


Figure A-2: Example of NGA cabling

Based on a platform, MLT or TFID analyzer the schematic on Figure A-3 illustrates the simplicity of a networked system which incorporates AM's, such as Chemiluminescence Detectors, MLT's (NDIR/UV/VIS plus Oxygen or TCD) and Flame Ionisation Detectors.

The system I/O modules (SIO, DIO) of the platform (or MLT/TFID analyzer) support all integrated analyzer modules with analog, digital and serial interfaces as well as relay outputs.

Other system functionality includes links to associated sample handling (PLC) and Data Acquisition Systems such as WinControl.

Local I/O are existing to MLT, TFID and CAT 200 analyzers only and support the corresponding analyzer module only.

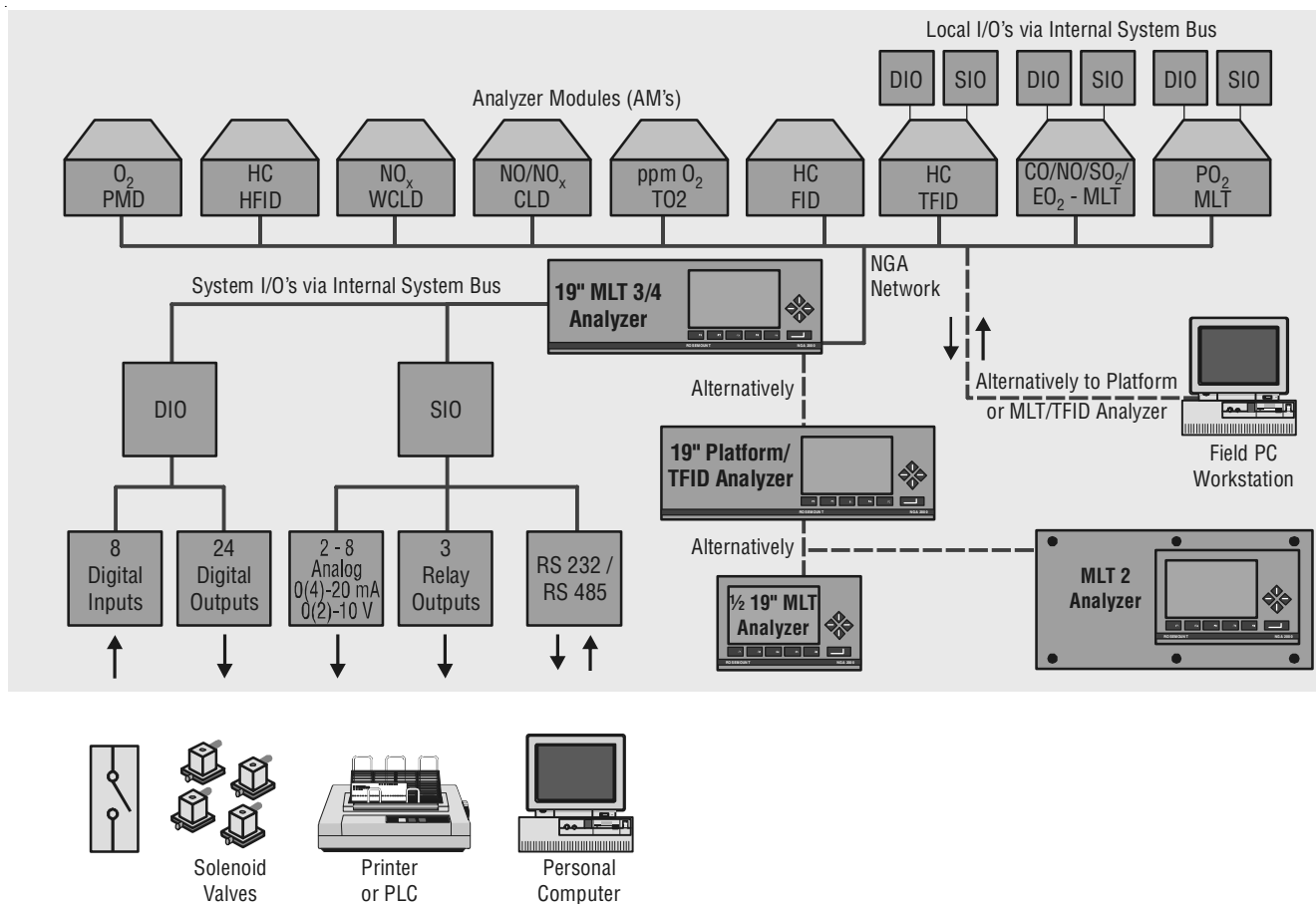


Figure A-3: Example/Possibilities of NGA Analyzer Systems

System unit	SIO/DIO-Configuration
<u>CLD/FID/HFID analyzer module (AM):</u> <ul style="list-style-type: none"> • without front panel, i.e. without control unit (host) • can be combined with a platform, a MLT analyzer, a TFID analyzer; a CAT 200 analyzer or a customer developed control unit 	<ul style="list-style-type: none"> • <u>No local CLD/FID/HFID I/O's</u>
<u>Platform (Control Module Software):</u> <ul style="list-style-type: none"> • Control unit with front panel • Without measurement channels 	<ul style="list-style-type: none"> • 1 SIO and up to 4 DIO's (or 5 DIO's) can be installed in the platform (CM I/O's) • SIO and DIO's can be configured for all AM channels connected to the platform
<u>HFID analyzer</u> <ul style="list-style-type: none"> • HFID analyzer module into a platform with front panel • HFID analyzer module combined with MLT/TFID/CAT 200 analyzer 	<ul style="list-style-type: none"> • 1 SIO and 4 DIO's (or 5 DIO's) can be installed in the platform • 1 SIO and 1 DIO (or 2 DIO's) can be installed in the MLT/TFID/CAT 200 analyzer (CM I/O) • SIO and DIO can be configured for all AM's connected to the MLT/TFID/CAT 200 analyzer

Table A-1: Possibilities of NGA 2000 I/O combinations

SECTION 1

DESCRIPTION AND SPECIFICATIONS

1-1 OVERVIEW

This manual describes the Heated Flame Ionization Detector (HFID) Analyzer Module of Emerson Process Management's NGA 2000 Series of gas analysis components (See Figure 1-2 and 1-3).

The HFID Analyzer Module is designed to continuously determine the concentration of hydrocarbons in a flowing gaseous mixture at a user-selectable temperature setpoint between 93 °C and 204 °C (200 °F and 400 °F). The concentration is expressed in parts-per-million or percent of volume..

The HFID Analyzer Module is designed as a slide-in module (if configured in stand-alone instrument fashion), removable from the front of the Platform, with gas connections made from the rear. All electronics relative to sample detection and conditioning are included in this module.

1-2 TYPICAL APPLICATIONS

The monitoring of carbon bed scrubber for low-level hydrocarbon contaminants, determining of the hydrocarbon content of exhaust emissions from internal combustion engines and continuous emissions monitoring of flue-gas emissions (e.g. incinerators) are examples of typical applications for the HFID Analyzer Module

1-3 SAFETY GAS FEATURES

The HFID Analyzer Module is designed with a factory-installed continuous dilution purge system in accordance with standard ANSI/NFPA 496-1993, Chapter 6. Front-panel LEDs indicate that the burner flame is lit and that the purge system is enabled. In addition, fuel gas is automatically shut off when a flame-out condition occurs of the safety system is disabled.

The purge system is enabled only if there is proper purge gas flow in, purge gas pressure, and internal case pressure, and after five times the case volume has been exchanged.

All tubing ahead of the burner is rigid metallic tubing assembled with ferrule/nut type compression fittings. However, should an internal fuel leak occur, a worst-case leak would be dissipated below 25% of the LEL of hydrogen through the combination of an inlet fuel flow restrictor and purge gas flow.

This module is designed to use 40% H₂/60% He fuel at a maximum inlet pressure of 3446 hPa-gauge (50 psig).

A standard HFID Analyzer Module is only equipped to analyze a non-flammable sample, below 100% of the LEL.



WARNING

POSSIBLE EXPLOSION HAZARD

Protection against explosion depends upon a special fuel flow restrictor in the fuel inlet fitting. Do not remove fuel inlet restrictor. Use the correct fuel flow restrictor for the fuel being used. Replace only with factory applied fitting.

Do not use 100 % hydrogen fuel in a 40 % H₂ / 60 % He configured Analyzer Module. An explosion resulting in severe personal injury or death could occur.

1-4 THEORY OF TECHNOLOGY

This Analyzer Module uses the flame ionization method of detection. The sensor is a burner in which a regulated flow of sample gas passes through a flame sustained by regulated flows of a fuel gas (hydrogen or a hydrogen/diluent mixture) and air.

With a flame, the hydrocarbon components of the sample stream undergo a complex ionization that produces electrons and positive ions. Polarized electrodes collect these ions, causing current to flow through an electronic measuring circuit.

The ionization current is proportional to the rate at which carbon atoms enter the burner, and is therefore a measure of the concentration of hydrocarbons in the sample. This measure of concentration is placed on the network, where it can be shown on the Platform Display or on other data acquisition devices.

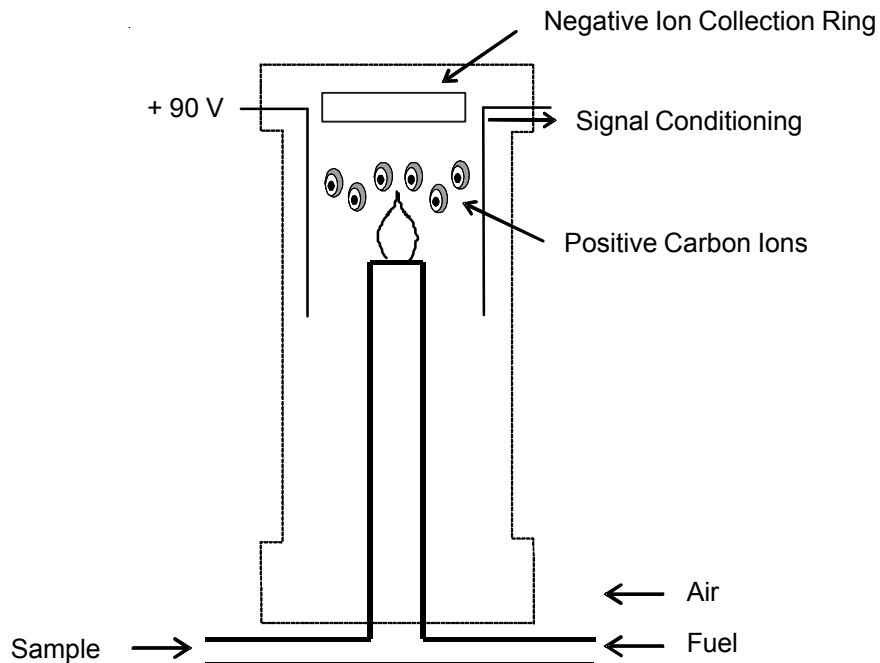


Figure 1-1: Function Principle of FID Measurement

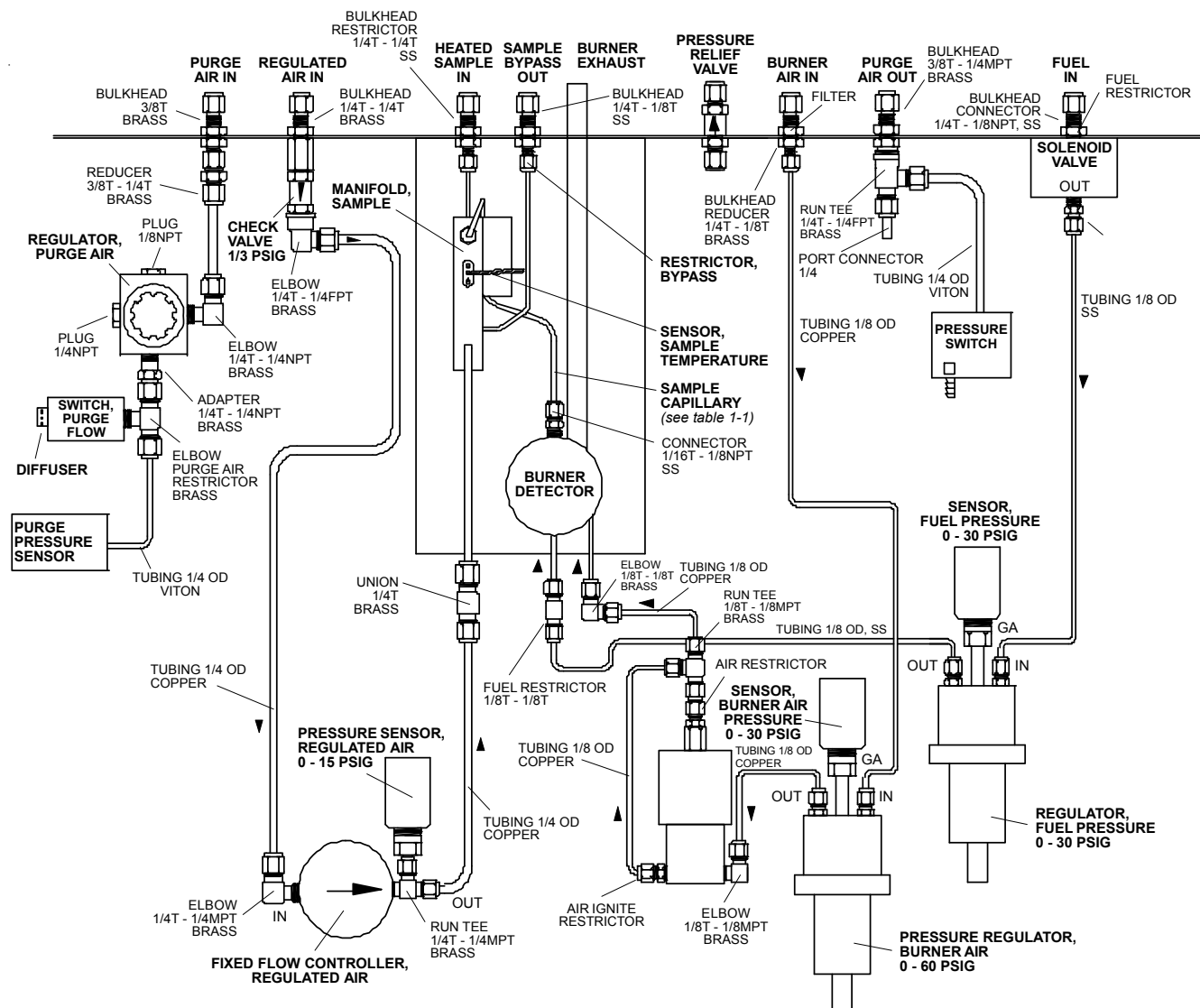


Figure 1-2: HFID Analyzer Module - Flow Diagram

Brief Description	Part Number
Sample Capillaries	
Sample Capillary 9.7 cc/min. @ 3.5 psig	657486
Sample Capillary 2.5 cc/min. @ 3.5 psig	657550

Table 1-1: Sample Capillary depending on Module Configuration

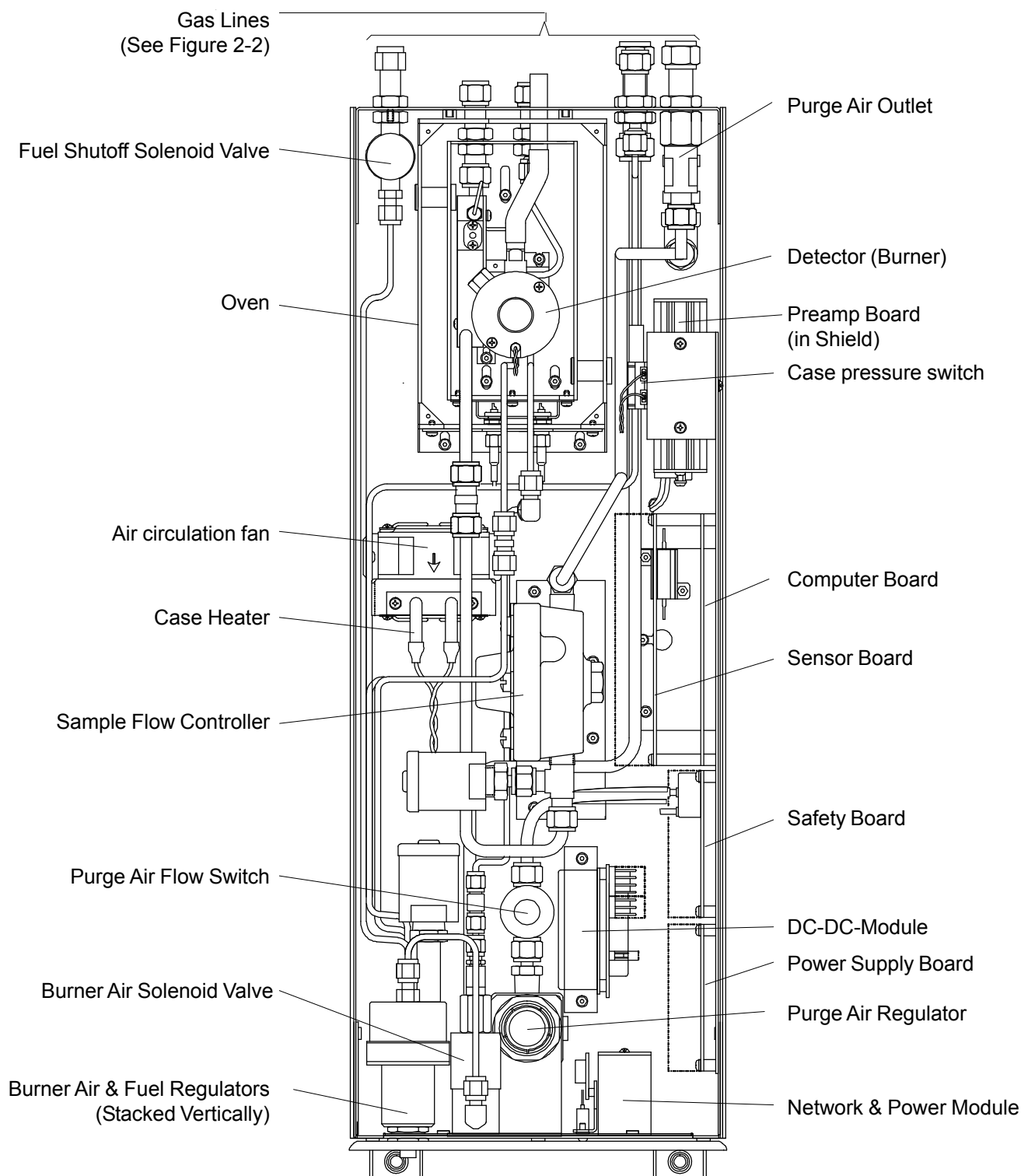


Figure 1-3: HFID Analyzer Module - Top View

1-5 SPECIFICATIONS

a. General

Measurement Species:	Total hydrocarbons
Ranges (H ₂ /Fuel):	
Low Range	0 to 10 ppm CH ₄ through 1 to 1 % CH ₄ at an oven setpoint between 113 °C and 191 °C (235 °F and 376 °F)
High range	0 to 50 ppm CH ₄ through 0 to < 5 % CH ₄ at an oven setpoint between 113 °C and 191 °C (235 °F and 376 °F)
Analysis temperature	Adjustable from 93 °C to 204 °C (200 °F to 400 °F), maintained within ± 6 °C (± 11°F) from the setpoint
Repeatability:	< 1 % of fullscale for successive identical samples, at a constant temperature, sample flow and fuel, burner air, regulated air and sample pressures
Min. Detectable Level:	0.10 ppm CH ₄
Noise:	< ± 1 % of fullscale
Linearity:	< ± 1 % of fullscale, < ± 2 % of data point (must be above the minimum detectable level)
Response Time:	< 1.5 sec., 0 % to 90 % of fullscale
Drift:	
Zero	< ± 1% of fullscale / 24 hours at constant temperature, hydrocarbon concentration of supply gases, sample flow and fuel, burner air, regulated air and sample pressures
Span	< ± 1 % of fullscale / 24 hours at constant temperature, hydrocarbon concentration of supply gases, sample flow and fuel, burner air, regulated air and sample pressures
Effect of Temperature:	< ± 2 % of fullscale for any temperature change of 10 K and rate of change less than 10 K/hour
Operating Temperature:	15 °C to 35 °C (59 °F to 95 °F)
Power Requirements:	+24 VDC ±5%, 120W max.. direct to analyzer module: Ripple and Noise: < 100 mV peak to peak Line and Load Regulations: < ± 1 %

b. Physical

Case Classification:	General purpose for installation in weather-protected area
Dimensions:	See Figure 2-6: Outline and Mounting Dimensions
Weight:	15.9 kg (35 lbs.)
Material in Contact with Sample	Stainless steel and glass-filled Teflon
Mounting:	Horizontally, inside a Platform or custom-installed in a panel
Max. Length of LON Cable:	1,600m (1 mile) between Analyzer Module and Platform

c. Gas requirements

Sample	Non-flammable, below 100 % of LEL
Flow Rate:	1.0 to 2.5 l/min
Supply Pressure	345 to 620 hPa-gauge (5 to 9 psig)
Temperature:	110 °C to 230 °C (230 °F to 446 °F), < 20 K variance / 24 hours, < 10 K variance / hour
Particles:	Filtered to < 2 microns
Dewpoint:	<15 °C below the setpoint
Regulated Air:	Instrument air or Nitrogen
Flow Rate:	1.0 to 4.0 l/min
THC	< 2 ppm CH ₄
Supply Pressure	689 to 1,723 hPa-gauge (10 to 25 psig)
Particles:	Filtered to < 2 microns
Purge Air:	Instrument air, Nitrogen or other non-flammable gas (refer to ANSI/NFPA 496 for the requirements for the Protective Gas System)
Flow Rate:	16.0 to 18.0 l/min
Supply Pressure	689 to 1,378 hPa-gauge (10 to 20 psig)
Fuel Gas:	Premixed 40 % hydrogen (H ₂) and 60 % helium (He)
Flow Rate:	80 to 100 ml/min
THC	< 0.5 ppm CH ₄
Supply Pressure	3,101 to 3,446 hPa-gauge (45 to 50 psig)



WARNING

POSSIBLE EXPLOSION HAZARD

**Do not use pure (100%) hydrogen (H₂) fuel in a 40% H₂ / 60% He configured Analyzer Module.
An explosion resulting in severe personal injury or death could occur.**

Burner Air:	Zero-grade air
Flow Rate:	355 to 400 ml/min
THC	< 1.0 ppm CH ₄
Supply Pressure	1,723 to 3,446 hPa-gauge (25 to 50 psig)

d. Gas Connections

Sample In:	1/4" O.D. tube fitting, stainless steel
Regulated Air In:	1/4" O.D. tube fitting, brass
Burner Air In:	1/4" O.D. tube fitting, brass
Fuel In:	1/4" O.D. tube fitting, stainless steel
Purge Air In:	3/8" O.D. tube fitting, brass
Purge Air Out:	3/8" O.D. tube fitting, brass
Bypass Out:	1/4" O.D. tube fitting, stainless steel
Burner Exhaust Out:	3/8" O.D. tube connection, stainless steel (must slope downward 6 ° min. from horizontal)

NOTE

Burner Exhaust, Bypass Out and Purge Air Out to be vented to atmospheric pressure and to non-classified location in accordance with ANSI/NFPA-496 guidelines.

Pressure Relief Valve: See Caution below

CAUTION

PRESSURE RELIEF VALVE

No connection shall be made to this fitting. If this caution is ignored, damage to the case seals may occur, and the instrument will not operate properly.



WARNING

HIGH TEMPERATURES

The Sample In, Bypass Out and Burner Exhaust Out connections can reach temperatures of up to 250°C (480°F). Severe burns could result from touching these connections.

See the Preface section of the Platform manual for specifications regarding Platform-related components (e.g., case dimensions) and the I/O Module manual for specifications regarding I/O (e.g., relay outputs).

SECTION 2

INSTALLATION

**WARNING****GENERAL HAZARD**

Before starting to install this equipment, read the "Essential instructions" on the inside cover and the Safety Summary beginning on page P-2. Failure to follow the safety instructions could result in serious injury or death.

2-1 UNPACKING

If the HFID Analyzer Module is received as a separate unit, carefully examine the shipping carton and contents for signs of damage. Immediately notify the shipping carrier if the carton or contents is damaged. Retain the carton and packing material until all components associated with the HFID Analyzer Module are operational.

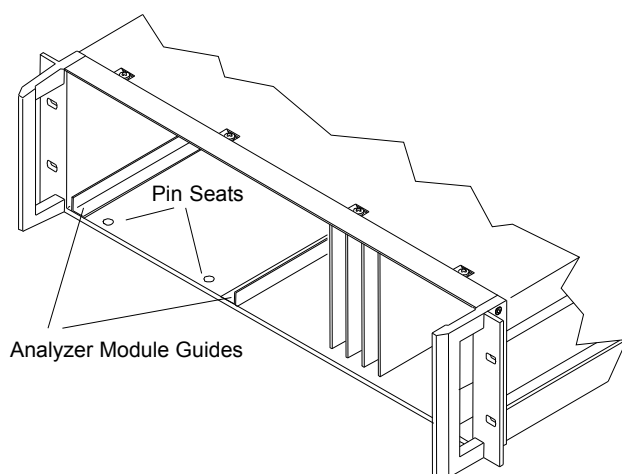


Figure 2-1: Analyzer Module Installation into Instrument Platform (view without front panel)

2-2 ASSEMBLY

If the HFID Analyzer Module requires assembly with other components (e.g., the Platform and associated I/O Modules), do so at this time.

To install the HFID Analyzer Module into a Platform:

1. Loosen the six fastening screws for the front panel of the Platform, hold the handles, and swing the front panel to the farthest right.
2. Following the guides on the bottom left and bottom center of the Platform, carefully slide the HFID Analyzer Module halfway into place.
3. Lift the spring-loaded pins on the front of the HFID Analyzer Module, and carefully slide in the rest of the distance.

If the module and Platform are difficult to assemble, remove the module, ensure the top cover of the module is firmly seated on the hold-down screws, and repeat the assembly procedure.

4. Secure the module in position by releasing the pins, which seat in the available holes in the bottom of the case (see Figure 2-1, below).
5. Connect network cable and power cable to the Analyzer Module (refer to Section 2-6 for electrical connections).
6. After startup and calibration have been performed, secure the front panel of the Platform with the six screws provided.

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2-3 LOCATION

Install the Analyzer Module in a clean, weather-proofed, non-hazardous, vibration-free location free from extreme temperature variations. For best results, install the Analyzer Module near the sample stream to minimize sample transport time.

WARNING

INSTALLATION RESTRICTIONS

For safety, the Analyzer Module should be installed in a non-confined, ventilated space. Do not block any of the rear panel outlets as they are part of the safety system.

Operating ambient temperature is 15 °C to 35 °C (59 °F to 95 °F), limited to temperature changes of less than 10 K/hr. Acceptable dew point range is less than 95 % relative humidity, but not in excess of 45 °C (113 °F) wet bulb temperature.

The cylinders of fuel, air, and calibration gas(es) and the source of purge and regulated air should be located in an area of relatively constant ambient temperature.

2-4 GASES

a. Overview

During normal operation, the Analyzer Module requires fuel and air to maintain the burner flame as well as suitable standard gases for calibration and instrument air for purge requirements. In addition, instrument air for regulated air is required to control the sample pressure at the sample capillary. Criteria for selection of these gases follow in Section 2-4c.

After initial startup or after startup following a prolonged shutdown, the analyzer may display baseline drift for a considerable period of time, particularly on the most sensitive range. Commonly, the drift is caused by small amounts of hydrocarbons in the inner walls of the tubing in both the internal flow system and the external gas supply system. Drift results from any factor influencing the equilibrium of these absorbed hydrocarbons, such as temperature or pressure.

Note that this type of drift occurs only when the flame is burning. If drift occurs when the flame is extinguished, the electronic circuitry is at fault. To minimize drift, use clean fuel and air, keep the analyzer clean, and locate the gas cylinders in an area of relatively constant ambient temperature.

The cylinders supplying all gases each should be equipped with a clean, hydrocarbon free, two stage regulator and a shutoff valve.

All new external gas tubing (except for PURGE IN/OUT and SAMPLE BYPASS) is strongly recommended, preferably precleaned, stainless steel, gas chromatograph grade tubing. Thoroughly clean before use (if a hydrocarbon based cleaning solvent such as acetone is used, purge tubing with dry nitrogen or helium for several minutes before using).

Gas line connections are compression fittings. Do not use pipe thread tape.

Since the oxidation of hydrogen is accompanied by the formation of water vapor, the Exhaust tubing always should be slanted downward at least 6 degrees from horizontal. Otherwise, water may accumulate in the line, causing back pressure and noisy readings, or may back up in the line and flood the burner. Depending on the percent of vapor in the sample, the sample bypass out connection may be required.

If the sample is toxic or noxious, or is to be reclaimed, connect the Bypass outlet to a suitable disposal system. Do not use any device that may cause back pressure in the line.

Purge air and burner air should be supplied from separate sources.

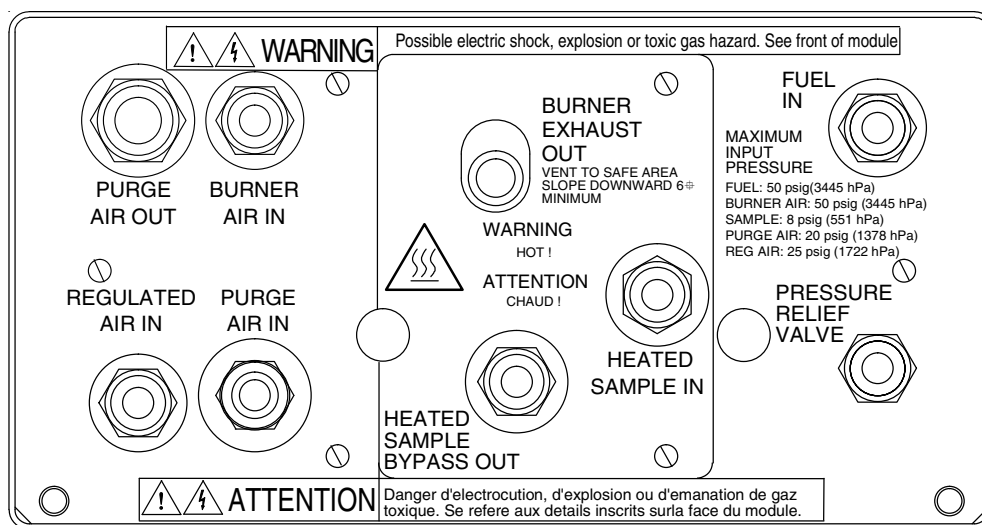


Figure 2-2: HFID Rear Panel Connections

b. Pneumatic Connections

WARNING

HIGH TEMPERATURES

The Sample In, Byass Out and Burner Exhaust Out connections can reach temperatures of up to 250°C (480 °F). Severe burns could result from touching these connections.

Make connections to these fittings when the oven heater is disabled ot the moduleis powered down.

(See Figure 2-2) Connect inlet and outlet lines for sample, burner fuel and air, exhaust, bypass, regulated air, and purge to appropriately labeled fittings on the rear panel. All connections are 1/4 -inch ferrule-type compression fittings except the PURGE AIR IN and OUT connections, which are 3/8-inch compression fittings. The BURNER EXHAUST is a 3/8-inch connection.

It is recommended that no connection be made to the PURGE AIR OUT port. If, however, the analyzer's location requires interconnection with a venting system, the 3/8" O.D. line should be kept as short as possible, and no longer than four feet.

CAUTION

POSSIBLE INSTRUMENT DAMAGE

No connection should be made to the PRESSURE RELIEF VALVE fitting. Doing so may cause damage the instrument.

CAUTION

PURGE AIR REQUIREMENT

If the front panel LEDs of the Analyzer Module, as installed, are not visible, the user should provide an indicator for the safety system as per ANSI/NFPA 496 standard.

c. Specifications

Fuel Gas

Standard analysis usually requires mixed fuel, i.e., 40 % (± 2 %) hydrogen and 60 % helium. H_2/He mixed fuel is recommended over H_2/N_2 fuel because of better linearity in concentration output. Such blends are supplied by many gas vendors specifically for this use, with a guaranteed maximum total hydrocarbon content of 0.5 ppm, measured as methane. This specification should be used when obtaining these mixtures.

NOTE

The fuel restrictor is marked with a red dot, and the sample capillary is marked with a red or green dot for mixed fuel applications.

Burner Air

In order to ensure a low background signal, burner air should contain less than 1 ppm maximum total hydrocarbon content. An alternate source for burner air and zero gas (see CALIBRATION GASES below) is a combination diaphragm pump and heated palladium catalyst. This process continuously removes moderate amounts of hydrocarbons and carbon monoxide from ambient air.

Purge Air

Instrument quality air, nitrogen, or other nonflammable gas is required for the safety purge system.

Regulated Air

Instrument quality air or nitrogen is required. The air should contain less than 2 ppm maximum total hydrocarbon content.

Calibration Gases

Calibration method and gases depend on the operating range, and the desired measurement accuracy. In all methods, zero and span gases are used, and are introduced through the sample inlet at the rear of the module.

ZERO GAS - Analysis is affected by the background gas of the sample. Therefore, it is recommended to use zero gas with as close to the background composition of the sample as possible. Normally less than 0.5 THC as CH_4 is sufficient.

SPAN GAS - Span gas consists of a specified concentration of methane or other hydrocarbon in a background gas such as nitrogen.

NOTE

Analysis is affected by the background gas of the sample. Therefore, span gas containing the same background gas as the sample is recommended. Then, the background effect is canceled out.

Sample Gas

Sample gas should be nonflammable (below 100 % of the sample's LEL). For high sensitivity applications requiring background gas compensation, contact the factory.

Flow Rate

The sample flow rate is 1.0 l/min to 2.5 l/min for a supply pressure between 5 and 9 psig. Flow rate for purge gas should be 16 to 18 l/min. Flow rate for regulated air should be 2 to 4 l/min.

Pressure / Filtration

SAMPLE PRESSURE at the SAMPLE inlet should be within the range 345 to 620 hPa-gauge (5 to 9 psig nominal), and internally, should be between 206.7 and 275.6 hPa-gauge (3.0 and 4.0 psig).

BURNER FUEL PRESSURE should be:

3101 to 3450 hPa-gauge (45 to 50 psig) for cylinder regulator, 1723 hPa-gauge (25 psig) nominal for internal pressure.

BURNER AIR PRESSURE should be:

1725 to 3450 hPa-gauge (25 to 50 psig) for cylinder regulator, 1035 hPa-gauge (15 psig) nominal for internal pressure.

REGULATED AIR PRESSURE should be:

689 to 1725 hPa-gauge (10 to 25 psig) for cylinder regulator.

PURGE AIR PRESSURE should be:

689 to 1380 hPa-gauge (10 to 20 psig).

NOMINAL INTERNAL CASE PRESSURE is about 0.5 to 1.0 inch of water, and the pressure relief valve is set at 1/3 psig (nominal).

2-5 LEAK TEST

The Analyzer Module is completely tested at the factory for gas leakage (leakage rate - 7.5 hPa/min. (- 0.11 psig/min.) with He or - 2.5 hPa/min. (- 0.036 psig/min.) with N₂). The user is responsible for leakage testing at the inlet and outlet fittings on the rear panel minimum twice a year (see Section 4-13).

The user is also responsible for internal leak testing periodically and if any internal pneumatic components are adjusted or replaced (with a test procedure chosen by the user).

CAUTION

OVER PRESSURE DAMAGE

Noncompliance with these specifications, particularly those concerning purge air, could cause over-pressure damage to the module.

2-6 ELECTRICAL CONNECTIONS

NOTE

Electrical installation must be in compliance with the requirements of NAMUR and DIN VDE and/or any applicable national or local codes (like local electricity supply enterprises (ESE)).

Refer to figure 2-3 and 2-4. Two electrical connections are required on the Analyzer Module: POWER and NETWORK. On the Analyzer Module, two NETWORK connectors are available, either of which is appropriate for:

1. Interconnection with the Backplane of the Platform. (See Instruction Manual for the NGA 2000 Platform).
2. "Daisy-chaining" with other NGA 2000 components.

Connect Analyzer Module POWER to a 24 VDC power source with a voltage tolerance of $\pm 5\%$ and a minimum power rating of 120 watts (either the Platform or external power source).

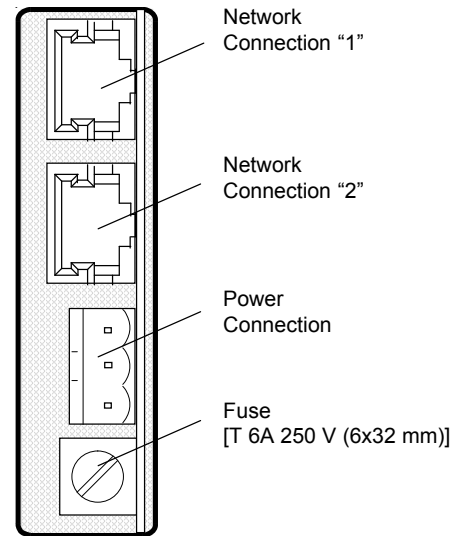


Figure 2-3: Front Panel Electrical Connections

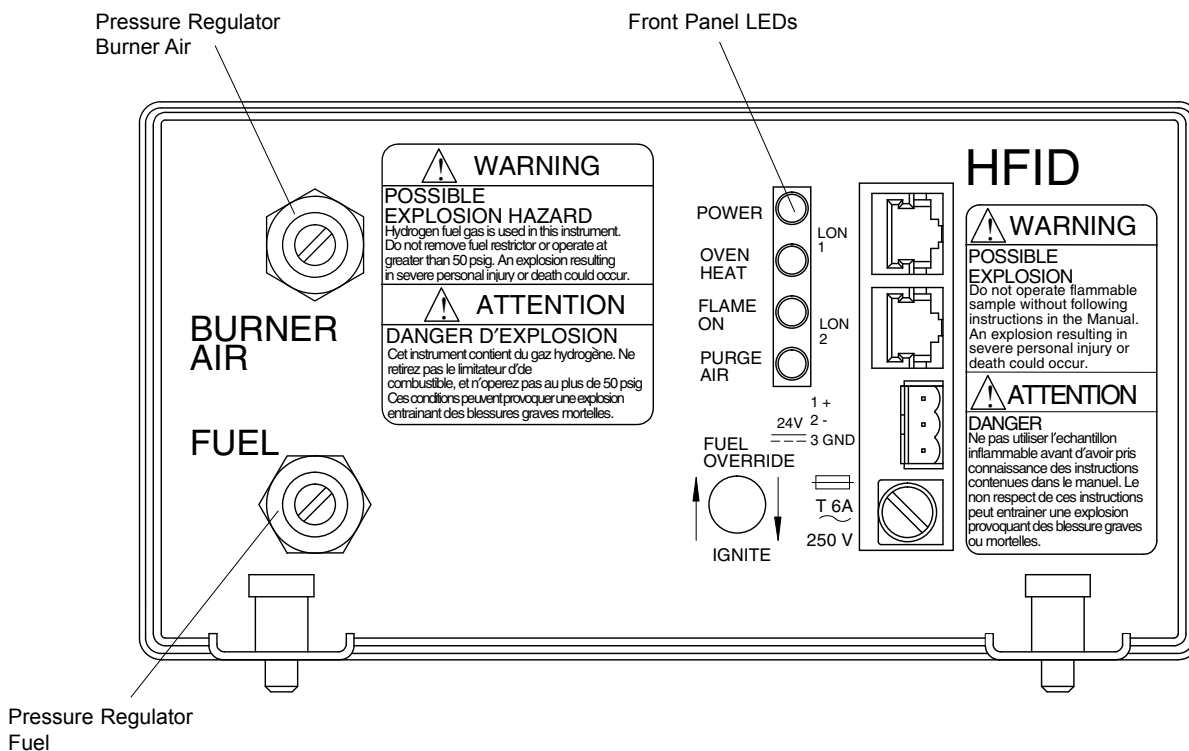


Figure 2-4: Front Panel Controls, Indicators and Electrical Connections

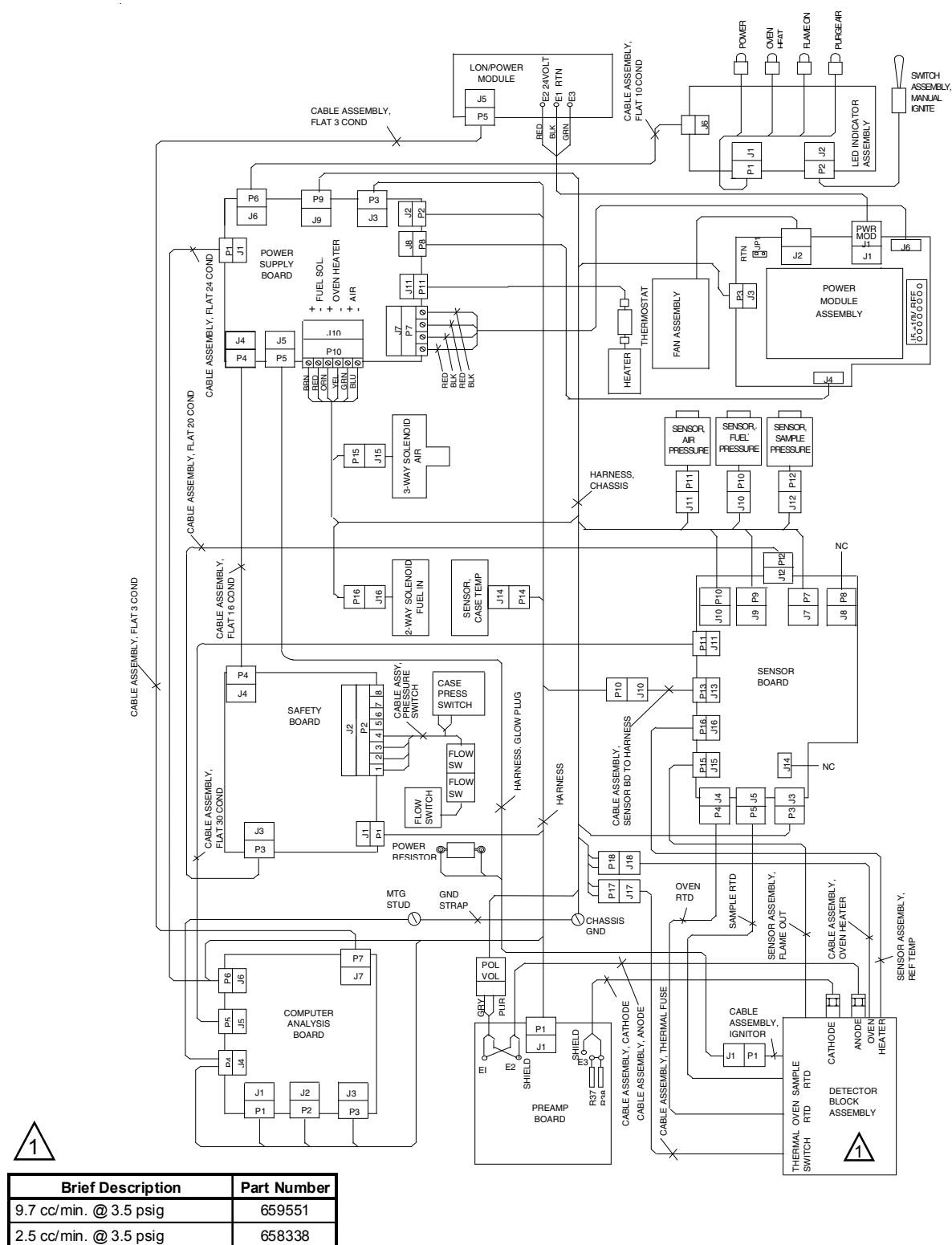
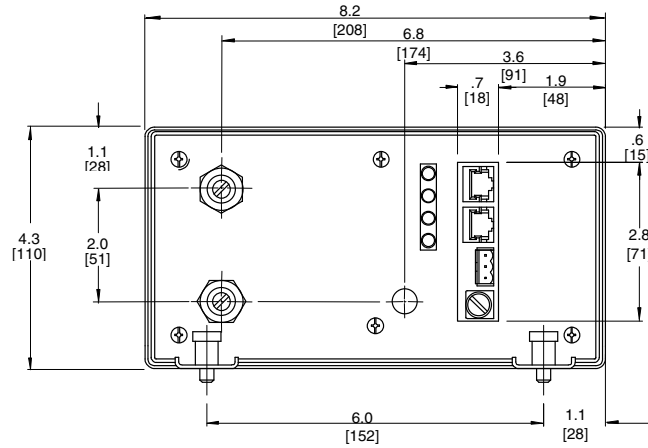
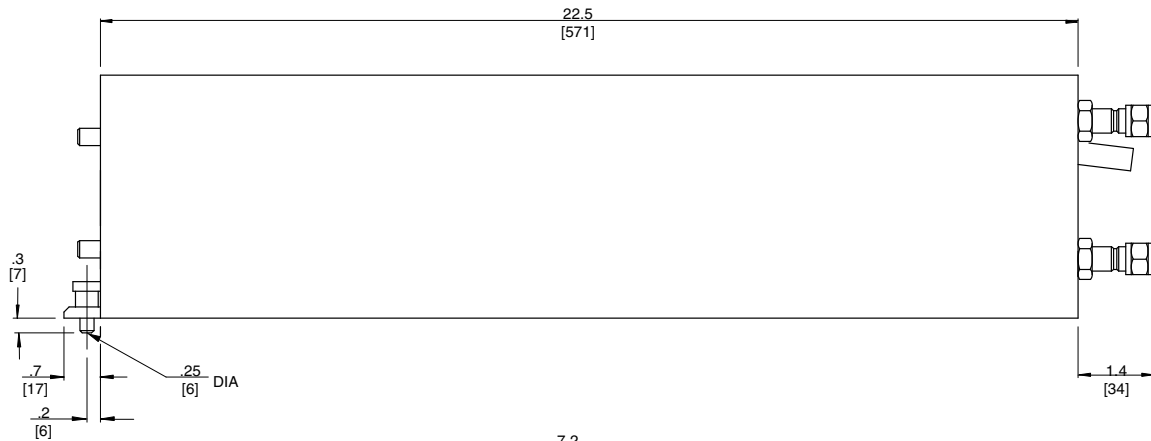


Figure 2-5: HFID Wiring Diagram

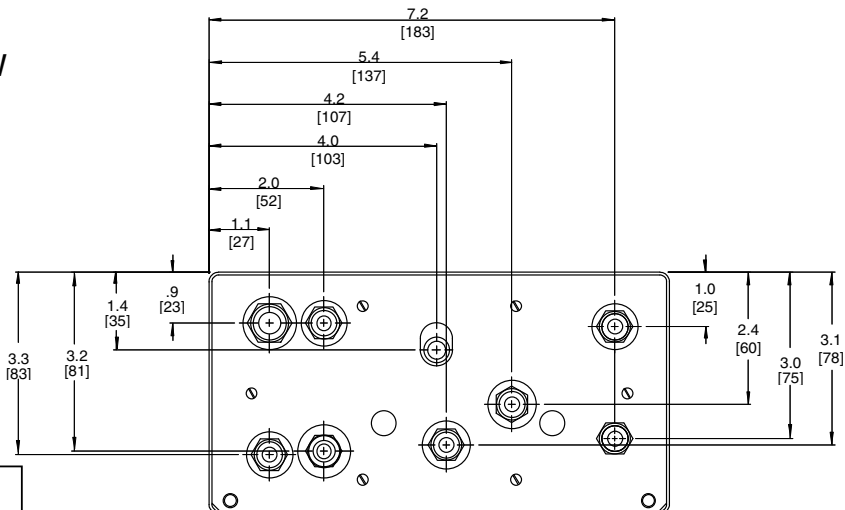
FRONT VIEW



SIDE VIEW



REAR VIEW



Dimensions:
INCHES
[MM]

Figure 2-6: Outline and Mounting Dimensions

2-7 INSTALLATION CONSIDERATIONS CHECKLIST

Verify the following:

- The Analyzer's location should be:
 - Clean
 - A well ventilated area
 - Weatherproofed
 - Non-hazardous
 - Vibration-free
 - Have stable ambient temperature
- The gas cylinders should be equipped with a clean, hydrocarbon free two stage regulator and shut off valve.
- All external tubing, regulators, valves, pumps, fittings, etc. are clean.
- The correct fuel type is being used.
- The THC content of the supply gases are compatible with the analysis range.
- The calibration background gases are similar to the sample
- The purge air out, burner exhaust, and bypass are vented to atmospheric pressure. The pressure should be constant.
- The burner exhaust tube must be slanted down a minimum of 6 degrees from horizontal.
- The bypass line connection must be slanted down a minimum of 6 degrees from horizontal for drainage of water condensation.
- If required, thermal insulation around the bypass fitting to prevent condensation to minimize the cold spot.
- The heated line is at the correct temperature.
- The sample, zero, and span gases are at the correct temperature.
- The heated line to have over temperature protection.
- The sample, bypass, and burner exhaust tubing material must handle high temperature and have thermal insulation to protect from burns.
- The purge air out tubing to be 3/8 inch and less than 4 feet in length.
- All external gas connections have been leak checked.
- The dead volume for external sample and fuel lines have been minimized.
- The stainless steel tubing used for the fuel and sample lines is clean.

SECTION 3 OPERATION

3-1 OVERVIEW

Once the HFID has been correctly assembled and installed, the analyzer module is ready for operation.

Before operating the system, verify that the Leak Checks have been performed in accordance with Section 2-5.

In this section, all operations for starting up the analyzer are explained. For more detailed information about software screens see associated Software Manual.

For the remainder of this section, Analyzer Module interconnection with a Platform or some interfacing component is assumed. Display and Keypad information refers to that which the user can expect to see and do with regard to the Front Panel of the Platform.

Depending from the software version that is installed, menu layout can change, whereas the principle of operation always stays the same.

3-2 STARTUP & INITIALIZATION

CAUTION

PRESSURIZED ENCLOSURE

This enclosure shall not be opened unless the area is known to be free of flammable materials or unless all devices within have been de-energized. Area classification for the protected enclosure:

Nonclassified.

Pressurization: Type Z

Temperature Identification Number: T4A

Power shall not be restored after enclosure has been opened (or loss of purge) until enclosure has been purged for a minimum of 6 (six) minutes at the minimum pressure of 689 hPa (10 psig).

For safety, the Analyzer Module should be installed in a non-confined, ventilated space. Do not block any of the rear panel outlets as they are part of the safety system.

a) Startup

1. Connect supply gases and outlets to/from module.
2. Turn ON the purge gas only. Wait a minimum of 6 minutes (see Section 3-2b, too)
3. Apply LON connection and power to the HFID Analyzer Module. If it is associated with a Platform, do this by plugging in the Platform to a power source. The Platform has no ON/OFF power button. Once power has been supplied to the Platform, the HFID Analyzer Module will be energized.

After switching on the HFID, the analyzer will begin its booting procedure which is apparent on the screen. The first part of the initialization procedure is a self check of the software and analyzer components. Various displays will show the status of the initialization.

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If the user's system contains only one Analyzer Module, all system components, the Controller Board and the network "self-install" (bind together) during initial startup. If the system contains more than one Analyzer Module, the startup sequence will interrogate the network to locate and identify all components on the network. The user will have to bind appropriate combinations of components after the startup sequence. See the Platform manual for instructions on binding combinations of modules.

Pressing the F1 key during initializing will reset the HFID brightness and contrast to factory settings. Pressing the F3 softkey will abort the network initializing, aborting any connection to other analyzers. In that case, only the menus of the local analyzer will be available.

At the end of the initializing routine the "measure" screen will display. This screen is the access to all other channels, menus and submenus. The actual display may differ from that shown depending on any custom configuration. After the warm-up period (about one hour for the HFID Analyzer Module), all modules are completely functional.

- 3. Check the 4 LEDs. The power green LED should be illuminated. The Oven amber LED should be blinking or on. The other LEDs should be off.
- 4. Check the general health of the analyzer by reviewing the status of the Self Tests. All "Pass" conditions should be obtained. All tested parameters should indicate "Pass". Enter the menu "Self test" as follows, using the softkeys F1 through F5:

Main (Menu)...

System Configurations and Diagnostics...

Diagnostic Menu...

Analyzer Module Diagnostic...

Self Test...

Line#1	Self Test Results	0.000 ppm
EEPROM Test:		Pass
EPROM Test:		Pass
RAM Test:		Pass
Power Supply Test:		Pass
Network Test:		Pass
20 bit ADC test:		Pass
12 bit ADC test:		Pass
Power Supply PCB Test:		Pass
Safety PCB Test:		Pass
Case Temperature Test:		Pass
Oven/Sample Temperature Test:		Pass
HOME	ESCAPE	TEST

Figure 3-1: Self Test Menu

Descriptions of the tests performed below:

- **EEPROM test** - Check the EEPROM on the Analysis Computer PCB.
- **EPROM test** - Checks the EPROM on the Analysis Computer PCB.
- **RAM test** - Checks the RAM on the Analysis Computer PCB.
- **Power supply test** - Verifies that all internal DC voltages are within the required tolerances.
- **Network test** - Checks the internal network interface.
- **20bit ADC test** - Checks the 20-bit ADC on the Analysis Computer PCB by sending a DC signal through the Preamp PCB and reading the signal back with the 20-bit ADC.
- **12bit ADC test** - Checks the 12-bit ADC on the Analysis Computer PCB by sending a DC signal and reading the signal back with the 12-bit ADC.
- **Power supply PCB test** - Checks the presence of the Power Supply PCB by activating the 3-way air solenoid.
- **Safety PCB test** - Checks the presence of the Safety PCB by sending a command and reading it back.

- **Case temperature test** - Compares the temperature read between Preamp temperature sensor and the case temperature sensor. They must be within 10°C of each other. This test sometimes fails if the case is opened. The sensor in the Preamp will take longer to cool off since it is in an enclosure. Re-running the self-test after thermal equilibrium will produce a positive result if the sensors are working properly.
 - **Oven/Sample Temperature test** - Compares the temperature read between the sample temperature sensor and the oven temperature sensor. They must be within 50°C of each other.
5. Wait for the Purge Air green LED to illuminate.

b) Temperature/Pressure Settings and Check

1. Introduce the remaining supply gases. (See section 1-5 Specifications)
2. Set and verify the internal gas pressures. Check pressure settings with the values defined in your Test Data Sheet (Figure 3-12).

Internal Pressure Regulator	Typical Operating Pressures
Burner Air	965 to 1103 hPa-gauge (14 to 16 psig), nominal 1030 hPa (15 psig)
Fuel	1516 to 1723 hPa-gauge (22 to 25 psig), nominal 1640 hPa (23.8 psig)
Sample (non-adjustable)	206 to 290 hPa-gauge (3.0 to 4.0 psig), nominal 260 hPa (3.8 psig)

Table 3-1: Typical Operation Pressures

Purge air of the following specifications must be present:

Flow: 16 to 18 l/min

Supply Pressure: 689 to 1,378 hPa-gauge (10 to 20 psig)

Noncompliance could cause damage to the module. At the very least, the module's safety system, which requires a certain volume of purge air flowing through the case before allowing burner ignition, will not allow the instrument to operate. The lowest purge air flow/pressure setting possible during burner operation is preferable.

This, the user should set the external purge air pressure initially at 689 hPa-gauge (10 psig). Check the "Miscellaneous Control Parameters" screen (Figure 3-2), and note whether the Purge Gas (switch) variable is "ON". If it is "OFF", increase purge air supply by 69 hPa-gauge (1 psig), and recheck the Purge Gas variable until it reads "ON".

DO NOT EXCEED 1378 hPa-GAUGE (20 PSIG). If the maximum setting is reached, and the Purge Gas variable does not read "ON", contact factory.

If the safety system is initiated successfully (Purge Gas variable is "ON"), continue with the remainder of the startup procedure.

NOTE

Do not restrict the PURGE OUT port and the pressure relief valve. They must be vented to atmospheric pressure.

Main (Menu)...

System Configurations and Diagnostics...

Diagnostic Menu...

Analyzer Module Diagnostic...

Miscellaneous Control Parameters...

Line#1	0.000 ppm
Miscellaneous Control Parameters	
Case Heater Current:	410 mA
Burner Air Valve Current:	0.3 mA
Alarm Messages valid for:	FAILURE
Ignition Command Status:	OFF
Fuel Enrichment Status:	OFF
Flame Status:	ON
Purge Gas Switch:	OFF
Ignition Status:	OFF
Fuel Type:	H2-He
HOME	ESCAPE TEST

Figure 3-2: Miscellaneous Control Parameters

c) Ignition of the Flame

1. Manual or Auto-Ignite the flame. The Flame-On green LED should be illuminated.

Two methods of burner ignition are possible:

auto-ignition and manual ignition

(Note: The burner is easier to ignite when the oven has reached the desired setpoint temperature.)

Auto-Ignition of the Flame

Auto-ignition provides fuel override and three attempted ignitions (default setting), if necessary.

Before ignition and operation, Fuel Flow must be set on "ON" in "Light Flame" display screen under Basic Controls (Figure 3-7) and oven temperature must be at least 85°C.

Manual Ignition of the Flame

The manual ignition switch on the Analyzer Module front panel must be manipulated in the following ways:

- Press up and hold for one minute. This opens burner fuel and air solenoids.
- Press down to ignite burner glow plug for up to 10 seconds.
- Repeat as necessary (if fuel and air sources are farther away than 10 feet, several more attempts may be necessary).
- If the flame has been lit, but the flame temperature increases slowly, perform the following steps:
 - 1) After igniting flame, release switch for 2 seconds
 - 2) Press switch down for 2 seconds
 - 3) Repeat release switch and press down steps as necessary.

2. Allow the case and oven to warm up approximately 1 to 2 hours.
3. Verify that all 4 LEDs are illuminated.

4. Note the four LEDs on the front panel of the Analyzer Module. They provide necessary information for either ignition procedure. The LEDs, when illuminated, denote the following information:

- Green - unit powered on
- Amber . continous illumination implies oven has reached operating temp. within ± 6 °C of setpoint.
- Green - flame on
- Green - purge air system intact (it has filled five volumes of the module interior)

5. Check and re-adjust the internal pressures if required .

The unit is ready for operation.

3-3 BINDING

To achieve full coordination between Analyzer Modules and associated I/O Modules, the user must bind those components together in the System Set Up portion of the Technical Configuration Menu in software.

3-4 CALIBRATION PROCEDURE

The HFID analyzer module may require periodic calibration with known zero and span gases in order to maintain a desired level of analytical accuracy. It is recommended, after initial startup, that the HFID Analyzer Module is calibrated at least once every eight hours.

This practice should continue until evidence indicates that some other interval is more appropriate depending on the analytical accuracy required.

Calibration is the process of flowing known zero or span calibration gas into the analyzer for a specified period (averaging time), after which the analyzer will automatically set its zero or span factors so that the concentration measurement equals the calibration gas value. A limit can be set, beyond which any attempt by the analyzer to reset its concentration measurement will cause a warning alarm. In this case, user intervention would be required to reset the alarm and attempt another calibration.

a. Calibration Setup

Calibration Gas List

This menu is used to set the concentration values of the calibration gases for each range, the Operational Sample Pressure and the Calibration Gas HC Response Factor.

Main (Menu)...

Analyzer and I/O expert controls & setup...

Analyzer module setup...

Calibration gas list...

Line#1	0.000 ppm
Calibration Gas List	
Zero gas - range 1:	0.00 ppm
Span gas - range 1:	10.00 ppm
Zero gas - range 2:	0.00 ppm
Span gas - range 2:	25.00 ppm
Zero gas - range 3:	0.00 ppm
Span gas - range 3:	100.00 ppm
Zero gas - range 4:	0.00 ppm
Span gas - range 4:	250.00 ppm
Calibration gas HC response factor:	1.00
Operational sample pressure:	344 hPa
Calibration...	
HOME	ESCAPE
INFO	

Figure 3-3: Calibration Gas List

Common HC factors are:

Methane (CH₄): 1.0

Ethane (C₂H₆): 1.9

Propane (C₃H₈): 3.0

These factors are not used to compensate the reading, but are used to select the proper preamp sense resistor.

In case that measuring ranges differ from ordering code, put in the measuring ranges:

Main (Menu)...

Analyzer and I/O, expert controls & setup...

Analyzer module setup...

Gas measurement parameters...

Range settings...

Line#1	0.000 ppm
Range Settings	
Minimum Range:	10.0 ppm
Maximum Range:	1000.0 ppm
Range 1 lower limit:	0.0 ppm
Range 1 upper limit:	10.0 ppm
Range 2 lower limit:	0.0 ppm
Range 2 upper limit:	25.0 ppm
Range 3 lower limit:	0.0 ppm
Range 3 upper limit:	100.0 ppm
Range 4 lower limit:	0.0 ppm
Range 4 upper limit:	250.0 ppm
HOME	ESCAPE
INFO	

Figure 3-4: Range Settings Menu

NOTE

In case that only one measuring range is in use, we suggest to set all other measuring ranges to the same value to prevent calibration failure. When doing so, set also all test gas values to the same value.

Calibration Parameters

This menu provides various parameter settings for all calibration performed from Basic or Expert modes.

Main (Menu)...

Analyzer and I/O expert controls & setup...

Analyzer module setup...

Calibration parameters...

Line#1	0.000 ppm
Calibration Parameters	
Calibration adjustment limits:	Disabled
Calibration averaging time:	9 s
Calibration failure alarm:	Yes
Cal failure error allowed:	50 %
Calibration time out:	59 s
Purge time:	0 s
Zero ranges:	SEPARATELY
Span ranges:	SEPARATELY
HOME	ESCAPE
CAL	INFO

Figure 3-5: Calibration Parameters Display

Calibration adjustment limits:

Set to "Disable" to recover from a calibration failure.

Calibration averaging time:

Set the time used by the analyzer to average its reading during calibration. A longer time will give a better calibration.

When using a system calibration, take care that averaging time is long enough for the analyzer to reach a settled reading. Otherwise, calibration may fail !

Calibration failure alarm:

When turned on ("yes"), issues a warning if the analyzer has to change its calibration by more than the Cal Failure Error, if warning alarms are enabled.

Cal failure error allowed:

The percentage by which the calibration can change before an alarm is triggered if the Calibration Failure Alarm is enabled.

Calibration time out:

Sets how long the analyzer will wait for the signal to stabilize before issuing a Warning.

Purge time:

Sets how long the analyzer will wait before performing an adjustment.

Zero (Span) ranges:

Used to select whether to calibrate ranges "TOGETHER" or "SEPARATELY". If together, zeroing or spanning will go through each range one by one. If the change required is too great, it will fail and send an alarm if warning alarms are enabled. In this case, Disable Calibration Adjustment Limits and try again. First check that the calibration gases are correct. If non-zero gases are used, or the changes are great, zero and span may have to be repeated a few times.

In case that a system calibration is used, set all ranges to "SEPARATELY".

Please note that Software will accept only span gas values that are a factor of 10-110% of the measuring range. From that, it is possible, that not all of the four measuring ranges can be calibrated altogether. In that case you will have to set the option to "SEPARATELY".

In case that a calibration is not possible because the difference of display to the true value is too great, switch of the "CalCheck" option.

Check of capillary type

Verify the capillary type in the "Analyzer Manufacturing Data".

Main (Menu)...

"F5" (MFG Data)...

Analyzer module manufacturing data...

Line#1	0.000 ppm
Analyzer Manufacturing Data	
More...	
Minimum range:	10.00 ppm
Maximum range:	10000.00 ppm
Measured Gas:	THC
Capillary:	9.7 ml/min @ 3.5 psig
Flow sensor:	Present
HOME	ESCAPE
INFO	

Figure 3-6: Analyzer Module Factoring Data

b. Execution

Calibration execution is as follows:

1. Set oven temperature setpoint according to Analyzer Module specific Test Data Sheet Test Data Sheet (Figure 3-12).
2. Apply regulated air at a pressure between 689 to 1,723 hPa-gauge (10 to 25 psig) according to Analyzer Module specific Test Data Sheet Test Data Sheet (Figure 3-12).
3. Allow case, oven, and sample temperatures to stabilize.

Main (Menu)...

Analyzer basic controls (calibration) & setup...

Line#1	Basic Controls	0.000 ppm
Measurement range number: 1		
Range upper limit:		24.9 ppm
Span gas concentration:		10.0 ppm
Automatic range change control:		Disabled
Bypass Sample Flow:		0.0 l/min.
Ranges with valid calibration:		1&2
Calibration status:		READY
Flame Condition:		ON
Light Flame...		
HOME	ESCAPE	ZERO SPAN

Figure 3-7: Basic Controls Menu

Zero Adjustment

Supply heated zero gas to sample inlet. Adjust external flow controller or throttle valve so that the sample inlet pressure is between 345 to 620 hPa-gauge (5 to 9 psig.), 485 hPa-gauge (7 psig.) nominal.

In the Basic Controls menu (Fig. 3-7), push the F3 softkey and enter the Analyzer Zero menu.

Line#1	Analyzer Zero	0.000 ppm
Are you sure ?		
You must have zero gas flowing through the analyzer.		
Calibration time:		24 s
Measurement range number:		1
Zero ranges:		SEPARATELY
Calibration status:		READY
Error message for last zero:		CAL OK
HOME	ESCAPE	ZERO INFO

Figure 3-8: Analyzer Zero Menu

Push the F3 softkey again, to start the zeroing process. Be sure to have zero gas flowing through your analyzer and to have it purged from sample gas before.

When the zeroing process is finished, "Calibration status" will turn to "READY".

Span Adjustment

After that, perform a Span adjust in the same measuring range:

Supply heated span gas to sample input. The reading of the sample pressure, oven, and sample temperatures should be the same as that used during the adjustment of the zero gas.

For that, push the F4 softkey in the Basic Controls menu, so that the Analyzer Span menu turns up:

Line#1	Analyzer Span	0.000 ppm
Are you sure ?		
You must have span gas flowing through the analyzer.		
Calibration time:		24 s
Measurement range number:		1
Span ranges:	SEPARATELY	
Calibration status:	READY	
Error message for last span:	CAL OK	
HOME	ESCAPE	SPAN INFO

Figure 3-9: Analyzer Span Menu

Push the softkey F4 again to start the spanning sequence. Be sure to have span gas flowing through your analyzer and to have it purged before.

When the spanning sequence is finished, the "Calibration status" will turn to "READY".

If the user is unable to calibrate the Analyzer Module (i.e., when ZERO or SPAN is initiated, nothing happens), several possible solutions present themselves. One solution relates to the use of an incorrect gas for zeroing or spanning (e.g., using a high concentration gas to zero or a zero gas to span the Analyzer Module). Simply recalibrating with the appropriate gas(es) will not correct the problem because the ZERO OFFSET or SPAN FACTOR has been set to an extreme value in the process.

c) Problems with Calibration

If the user is unable to calibrate the Analyzer Module (i.e., when ZERO or SPAN is initiated, nothing happens), several possible solutions present themselves. One solution relates to the use of an incorrect gas for zeroing or spanning (e.g., using a high concentration gas to zero or a zero gas to span the Analyzer Module). Simply recalibrating with the appropriate gas(es) will not correct the problem because the ZERO OFFSET or SPAN FACTOR has been set to an extreme value in the process.

To remedy the problem, do the following:

1. Verify the correct zero and span calibration gases are being used properly. If so, attempt to recalibrate according to instructions at the beginning of Section 3-4, ensuring that the oven, sample and case temperatures and displayed measurement reading are stable before initiating the calibration routine. If incorrect gases were used in the initial, failed calibration, skip to step 2.
2. Disable Calibration Adjustment Limits (Figure 3-5).
3. Recalibrate the analyzer module according to instructions at the beginning of section 3-4, ensuring that oven, sample, and case temperatures and displayed measurement reading are stable before initiating the calibration routine.
4. Enable Calibration Adjustment Limits in the Calibration Parameters menu (Figure 3-5).

NOTE

If the range selections straddle 72 5ppm, CH₄, the zero and span calibration for each range must be done separately.

3-5 ROUTINE OPERATION

a) Operation

After case, oven, and sample temperature stabilization, calibration, and binding, proceed as follows:

Supply heated sample gas to SAMPLE INLET. Adjust external flow controller or throttle valve so that the sample inlet pressure is between 345 to 620 hPa-gauge (5 to 9 psig.), 485 hPa-gauge (7 psig.) nominal. The reading on the SAMPLE pressure gauge and sample and oven temperatures should be the same as that used during adjustment of the zero and span calibration gas control.

Adjust the Range Number setting. The Analyzer Module will now automatically and continuously output the measured hydrocarbon content of the sample. Output is in terms of particular hydrocarbon present in the span gas. Note that readings obtained during operation depend on the concentration of total hydrocarbons in the sample.

The Analyzer Module will not allow the user to increase the upper limit of a range beyond the "maximum range" software setting.

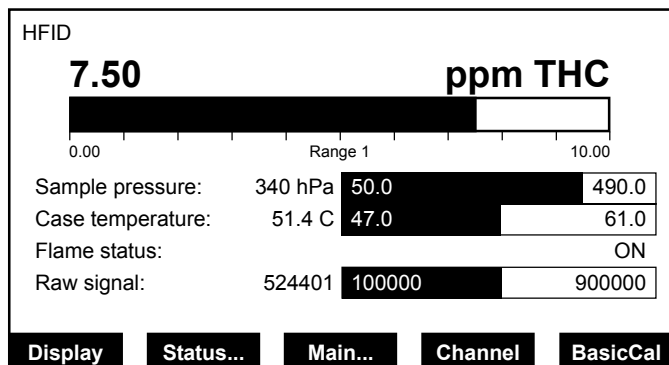


Figure 3-10: Measure Mode Display

After starting up the Analyzer Module, the Measure Mode Display is displayed as shown in figure 3-10.

After initial startup, or startup following a prolonged shutdown, the Analyzer Module requires about one day's continuous operation to stabilize. For several days afterwards, calibrate daily. The frequency of subsequent calibrations can be reduced as experience dictates, consistent with the accuracy requirements of the particular application.

To now check back physical parameters of the HFID Analyzer Module with the values defined in your Test Data Sheet, that you received with the analyzer, you have to select the "Physical Measurements"-Menu.

You will find excerpt of a Test Data Sheet as an example on the next page in figure 3-12.

Enter the diagnostics menu "Physical Measurements" as follows, using the softkeys F1 through F5:

Main (Menu)...
Expert Controls and Setup...
Analyzer Module Controls...
Physical Measurements...

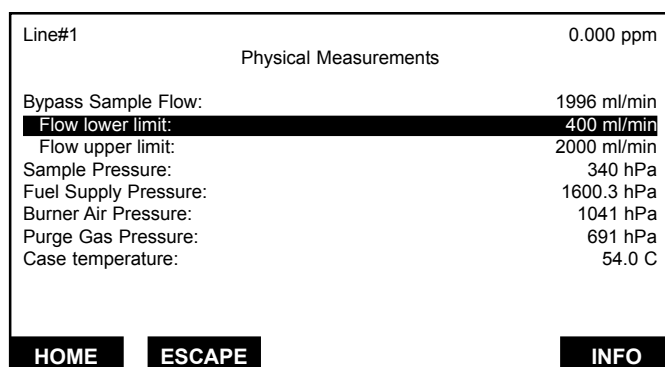


Figure 3-11: Physical Measurements Display

The menu "Physical Measurements" lets you monitor physical measurement parameters of the HFID analyzer.

b) Sensitivity

If maximum sensitivity is required from the HFID Analyzer Module, use an optimum combination of settings on the FUEL, and AIR pressure regulators. Settings must be determined experimentally, but the curves in Figures 3-14 and 3-15 may be used as guides.

c) Shutdown

During shutdown, always turn off fuel gas first, then the air and sample gases. The flame can also be turned off by setting Ignition System Enable to "Off" on the Light Flame menu (under Basic Controls, Figure 3-7). Subsequently, remember to set Ignition System Enable to "On" before attempting to ignite the flame.

External physical parameters are adjusted as follows

Supply Pressure Fuel Gas	3500,00	hPa	50,76	psig
Supply Pressure Burner Air	2000,00	hPa	29,01	psig
Supply Pressure Sample Gas	600,00	hPa	8,70	psig
Supply Pressure Regulated Air (N2)	700,00	hPa	10,15	psig
Supply Pressure Purge Gas Min.	691,00	hPa	10,02	psig
Sample Flow	no sensor			cc/min

The following parameters can be checked in menu "Physical Measurements"

Operation: Main Menu...
Expert Controls and Setup...
Analyzer Module Setup...
Physical Measurements...

Internal physical parameters are adjusted as follows

Sample Pressure	253,00	hPa	3,67	psig
Fuel Gas Pressure	1642,00	hPa	23,82	psig
Purge Gas Pressure	691,00	hPa	10,02	psig
Burner Air Pressure	1041,00	hPa	15,10	psig
Case Temperature	50,0			°C
Reference Temperature	148,7			°C
Flame Temperature	226			°C
Preamplifier Temperature	56,4			°C
Sample Temperature	190			°C
Oven Temperature	191			°C
Bypass Flow	4560			cc/min
Burner Air Flow	472,5			cc/min
Fuel Gas Flow	75,2			cc/min
Capillary Flow Rate	9,7 cc/min @ 3,5 psig			cc/min

Figure 3-12: Excerpt of a Test Data Sheet with values that are to be compared with physical measurements

3-6 SAFETY SYSTEM

The HFID Analyzer Module safety system will not allow ignition or continuous burner function unless the following conditions are present:

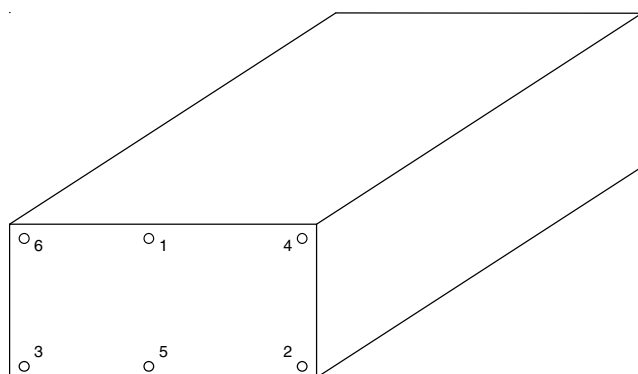
- The internal purge gas pressure is at least 380 hPa-gauge (5.5 psig).
Monitor message "Purge Gas Pressure" in "Physical Measurements" menu (Figure 3-11) for proper setting.
- Flow rate for purge air in is at least 16 l/min and case pressure is greater than 0.5 inches of water. (Monitor display message "Purge Gas (ON)" in "Miscellaneous Control Parameters" menu (Figure 3-2) for correct state. Proper sealing hardware must be used in order to obtain the required purge air in flow rate and case pressure).

- Five case volumes of purge air have been achieved and the three above conditions are present. The time duration to achieve a safe system is a minimum of 6 min. (Monitor the Purge Air Green LED (ON), Purge Control Status (ON), or Purge Air Alarm for indication of the state of the safety system.)

As stated above, proper sealing hardware is crucial to the successful operation of the safety system. Therefore, a specific torque sequence (shown in Figure 3-13) must be followed when the front panel of the module is being reinstalled after removal. All front and rear panel screws must be installed.

NOTE

Do not over-torque rear panel screws.



Torque Sequence:

- Screw #1, 4 to 5 turns
- Screw #2, 4 to 5 turns
- Screw #3, 4 to 5 turns
- Screw #4, 4 to 5 turns
- Screw #5, 4 to 5 turns
- Screw #6, 4 to 5 turns

Repeat torque sequence until all screws are tight.

The gasket must fill in between the front panel plate

Figure 3-13: Front Panel Torque Sequence

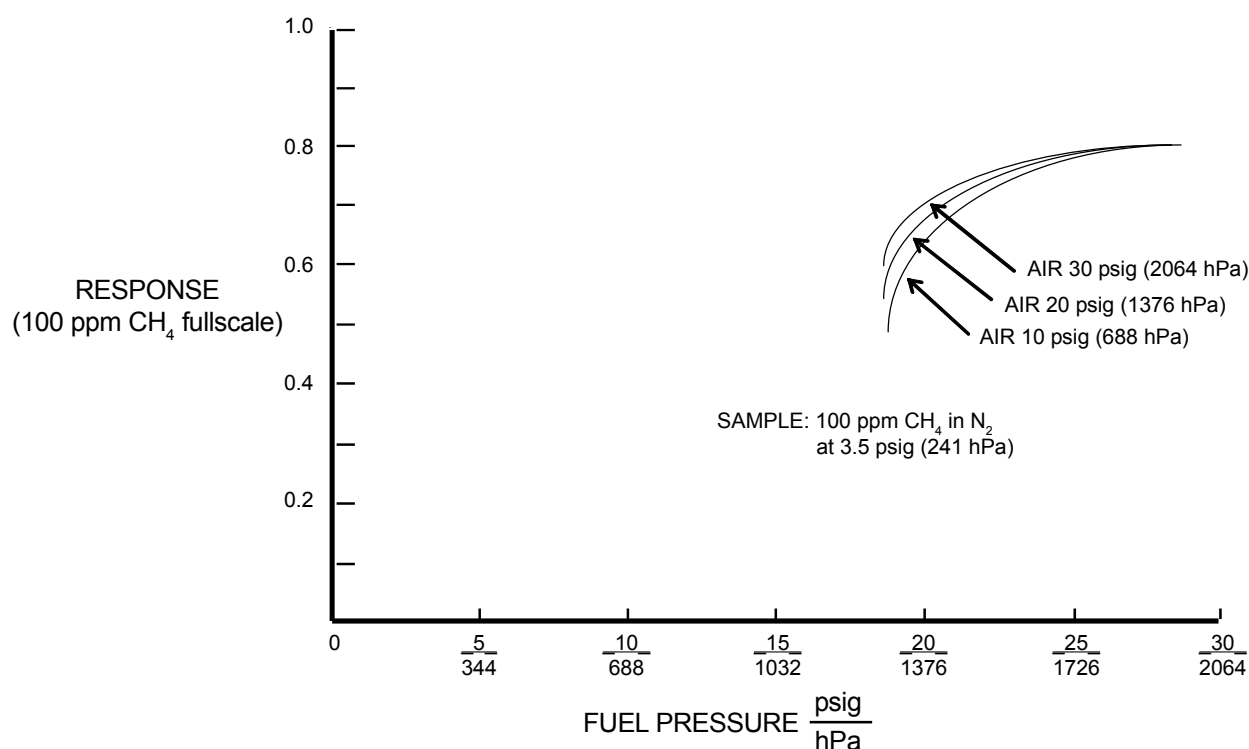


Figure 3-14: Typical Curve of Module Response vs. Pressure Setting on Fuel Pressure Regulator

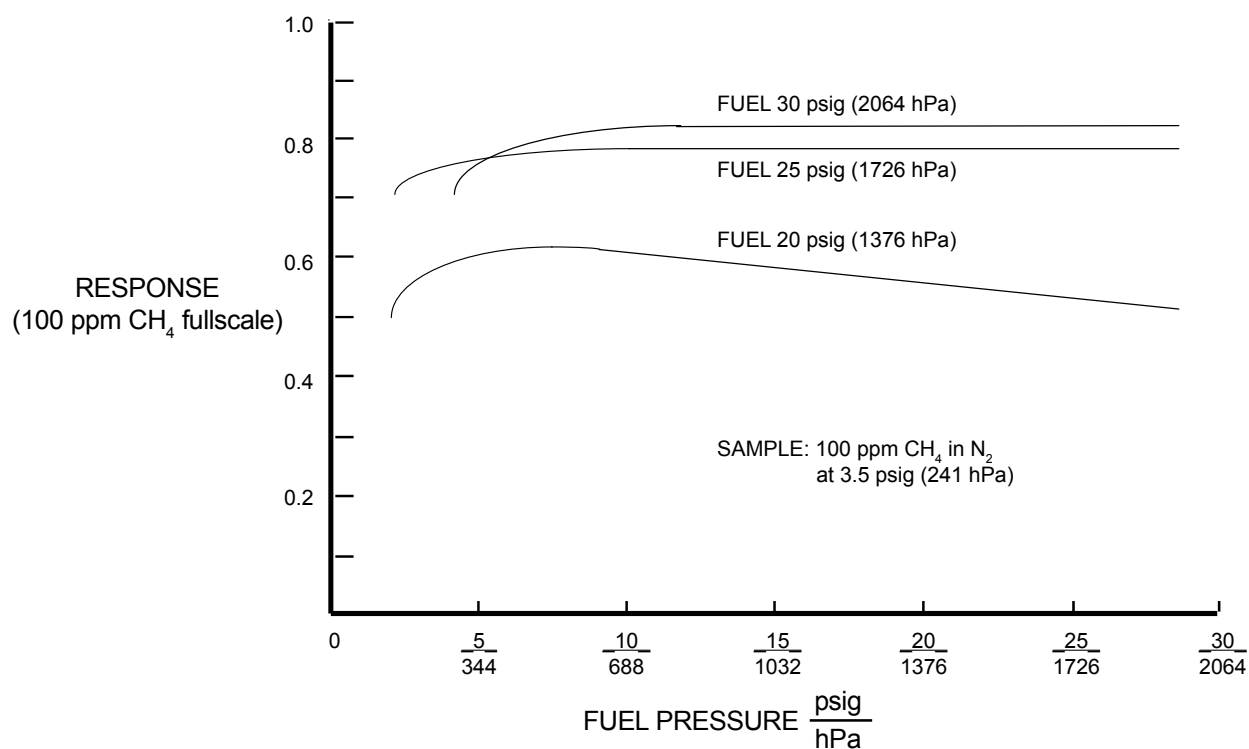


Figure 3-15: Typical Curve of Module Response vs. Pressure Setting on Air Pressure Regulator

DISPLAY MESSAGE	DESCRIPTION	TYPE
AIR FET	FID Air FET current	WARNING
AIR PRESS	FID Air Pressure	WARNING
BAIR FLOW	Burner Air Flow	WARNING
BAROMETER	System Barometer	WARNING
BFUEL FLOW	Burner Fuel Flow	WARNING
BLOCK FET	Heater current	WARNING
CASE TEMP	Case Temperature	WARNING
CRUDE NOISE	Calculated Noise	WARNING
CURRENTRNHI	Current, High Range	WARNING
CURRENTRNLO	Current, Low Range	WARNING
CURRENTSFAC	Current Range	WARNING
FLAME TEMP	Flame Temperature	WARNING
FUEL PRES	Fuel Pressure	WARNING
LIN ERROR	Linearizer Error	WARNING
N15 VOLTS	Power Supply -15V	WARNING
P10 VOLTS	Power Supply +10V REF	WARNING
P15 VOLTS	Power Supply +15V	WARNING
POL VOLTS	Polarizing Volts	WARNING
SAMP PRES	Sample Pressure	WARNING
CALRESULT	Calibration Error	FAILURE
PURGE AIR	FID Purge Air	FAILURE
SW ERROR	Software Error	FAILURE

Table 3-2: HFID Analyzer Module Alarms

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3-7 SYSTEM & NETWORK I/O MODULE CONTROLS (SETUP) - SYSTEM SIO

To adjust SIO functions, select

Main (Menu)...

Analyzer and I/O, expert controls & setup...

System & network I/O module controls...

System SIO module...

Figure 3-16: System SIO Module Menu

System SIO module menu allows you to adjust different SIO functions, like analog outputs and serial interfaces.

a. Analog Output Setup

In the System SIO Module menu (Figure 3-16) select "Analog output setup..."

Figure 3-17: Analog Output Setup Menu

Output number:

Choose the desired analog output (1-8) to set the parameters. The number of outputs depends on the analyzer configuration as 2, 4, 6 or 8.

Choose signal source module...

Select the "Analyzer Modules" submenu by selecting the "Choose signal source module..." line and pressing the Return (↵) softkey.

Select the tag of the desired reference channel with the ↑ or ↓ softkeys and then press the ↵ or → softkey. The display will return to the previous menu automatically and the selected reference channel will be displayed in the "Source module:" line.

The available selections may be different depending on the installed modules.

Figure 3-18: Analyzer Modules Menu

Choose Signal...

Select the "Signals" submenu by selecting the "Choose Signal..." line and pressing the ↵ softkey. (The list of signals will depend on the module chosen.)

Press the F5 softkey to go to additional menus to choose the Primary Variable signal for the analog output. The Primary Variable is the actual NO or NOx concentration.

See Section 5.2.1.1 of HFID Software Manual for complete list of signals.

The signal chosen here will be applied to the analog output (1-8) chosen above.

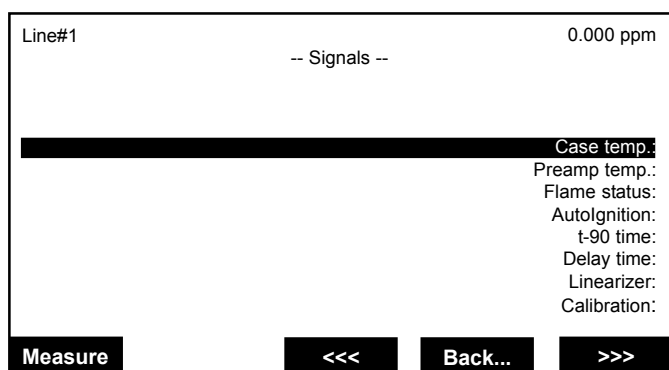
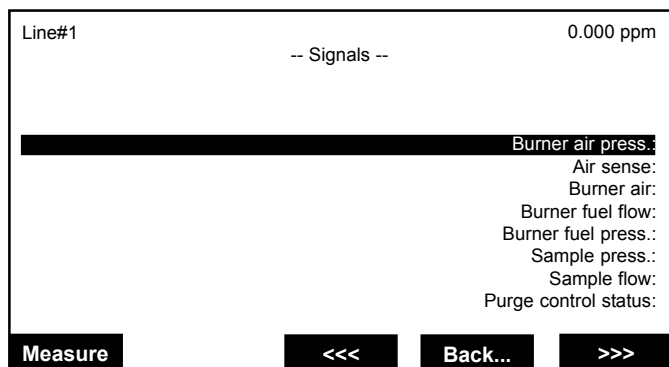


Figure 3-19: Signals Menu

Signal value for 0% (100%) output:

It is possible to set the signal value for 0 % output and for 100% output so as to output only a portion of the entire range.

Example:

- Range from 0 to 1,000 ppm
- 0% value to be 400 ppm, 100% value to be 700 ppm.
- Analog output normally:
0 V = 0 ppm, 10 V = 1,000 ppm
- After changing the output scaling:
0 V = 400 ppm, 10 V = 700 ppm.

Move the cursor to the "Signal value for 0 % output:" line and adjust the value to 400. Then change to the "Signal value for 100 % output:" line and adjust the value to 700.

NOTE

If the measurement range is changed, the settings done in this menu will revert back to the standard values of the range. The output values can be changed permanently in the menu "Range Settings."

NOTE

The signal range of the analog output should be less than the smallest range of the channel. Otherwise the analog output may exhibit excessive noise.

Output current:

Select the desired output range in the "Output current range:" line. The options are 0...20 mA or 4...20 mA.

Hold output during calibration:

Enable this option to hold the analog output to the last value during calibration.

Pressing the F5 (More...) softkey changes the to the submenus "Output Signal if Assigned Module Fails" and "Fine Adjustment."

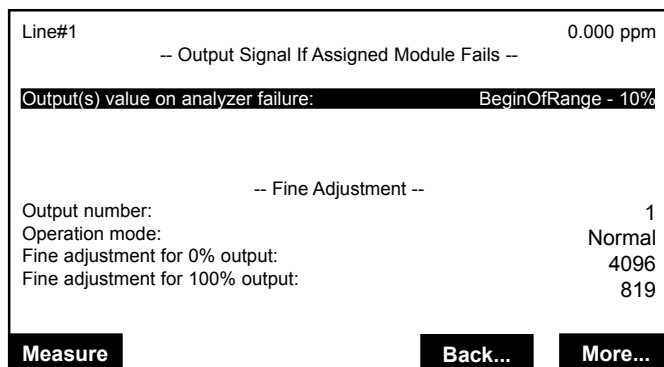


Figure 3-20: Output Signal If Assigned Module Fails Menu

Output(s) value on analyzer failure:

Choose the desired signal level to cause a failure condition. The choices are:

- Acutal
- BeginOfRange
- EndOfRange
- BeginOfRange-10%
- BeginOfRange+10%

Output number:

Choose the output number (1-8) for setting the fine adjustment.

Operation mode:

Normal: The absolute measurement signal will be sent to the analog output.

Adjust 0V: Used to set the display equal to the analog output for 0 V and 0 mA. Life zero signals (4 - 20 mA and 2 - 10 V) are set automatically and cannot be adjusted.

Adjust 10V: Used to set the display equal to the analog output for 10V und 20mA.

Select the "Fine adjustment for 0% output" and/or "Fine adjustment for 100 % output" lines with the \downarrow or \rightarrow softkey. Adjust to the desired value with the \uparrow or \downarrow softkey and confirm with the \downarrow softkey.

The range of values are:

- 3,000 to 6,000 for 0 % (default 4096)
- 600 to 1,000 for 100 % (default 819)

The last three lines of the "Analog Output Setup" menu are displayed only for configuration values of the analog output.

Signal name: The name of the signal chosen the "Choose signal" menu.

Current signal value: The current value of the variable.

Source module: The name of the module chosen in the "Choose signal source module" menu.

Pressing the F5 (More...) softkey changes to the submenu "Special Scaling for Concentration Signal"

Line#1	0.000 ppm
-- Special Scaling for Concentration Signal -- (Scaling is the same as range limits)	
Output #1:	Yes
Output #2:	Yes
Output #3:	Yes
Output #4:	Yes
Output #5:	Yes
Output #6:	Yes
Output #7:	Yes
Output #8:	Yes
Measure	Back... More...

Figure 3-21: Special Scaling for Concentration Signal Menu

This menu allows for the setting of each of the 8 outputs to be the same as the range limits "Yes" or as to set on the previous menus.

Pressing the F5 (More...) softkey changes to the submenu "Analog Output Updates per Second."

Line#1	0.000 ppm
-- Analog Output Updates Per Second --	
Output #1:	0
Output #2:	0
Output #3:	0
Output #4:	0
Output #5:	0
Output #6:	0
Output #7:	0
Output #8:	0
Measure	Back...

Figure 3-22: Analog Output Updates per Second Menu.

This menu allows for the setting of the update rate for each of the 8 outputs.

b. Serial interface Setup

The submenu "Serial interface Setup" is used to set the parameters for data transfer between the analyzer and external devices. The choices in this menu depend on the configuration of the analyzer. The full specification of the serial interface is described in its own manual.

In the System SIO Module menu (Figure 3-16) select "Serial interface setup..."

Line#1 0.000 ppm

-- Serial Interface Setup --

Baud rate: 19200

Data bits: 8

Stop bits: 1

Parity: None

Echo mode: Disabled

Handshake: Xon/Xoff

Transmission delay: 0

Type of installed serial interface: RS232

Communication protocol: AK

Special protocol definitions...

Measure Back...

Figure 3-23: Serial Interface Setup Menu

Options:

- Baud rate:
300, 1200, 2400, 4800, 9600, 19200
- Data bits: 7, 8
- Stop bits: 1, 2
- Parity: None, Even, Odd
- Echo mode: Enabled, Disabled
- Handshake: None, Xon, Xoff
- Transmission delay: 0...100.

Type of installed serial interface: RS232, RS485/2w, RS485/4w, RS485/4w bus, None.

Communication protocol: AK, MODBUS RTU, None (not applicable to HFID)

NOTE

The "special protocol definitions..." line accesses a submenu for setting the parameters of the AK and MODBUS RTU (not available yet) communication protocols.

Line#1 0.000 ppm

-- AK Protocol Definitions --

Device address (RS-485 only): 1

Measure Back... More...

Figure 3-24: AK Protocol Definitions Menu

The value can range from 1 to 50.

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c. Relay Outputs Setup

There are three relays on the SIO board. The contact logic can be set with a jumper on the SIO board to select NO (normally open) or NC (normally closed). Full details of the SIO board are contained in its own manual.

In the System SIO Module menu (Figure 3-16) select "Relay outputs setup..."

Line#1 0.000 ppm

-- Relay Outputs Setup --

Output number: 1

Invert signal: Disabled

Choose source module...

Choose signal...

Signal comes from: ????

Signal name: ????

Actual status: Off

Measure Back...

Figure 3-25: Relay Outputs Setup Menu

Output number:

Corresponds to the relay number 1-3.

Invert signal:

"Disabled" signal is normal, "Enabled" signal is inverted.

Choose source module...

Line#1 0.000 ppm

-- Choose Source Module --

Control Module: 0.0

1000723 Line#1: 1.0

Measure <<< Back... >>>

Figure 3-26: Choose Source Module Menu

Choose desired source module for the relay output number (1-3) being configured.

The list of modules will depend on the installed modules.

Choose signal...

Line#1 0.000 ppm

-- Choose Signal --

Function control

Maintenance request

Failure

Cal. In progress

Zero in progress

Span in progress

Zero failed

Span failed

Measure <<< Back... >>>

Figure 3-27: Choose Signal Menu

Choose desired signal for the relay output number (1-3) being configured.

The list of signals will depend on the chosen module. If available, press the >>> (F5) softkey for additional signals.

The three lines displayed at the bottom of the "Relay Outputs Setup" menu show the current status of the selected relay output.

Signal comes from: The module chosen from the "Choose Source Module" menu.

Signal name: The signal chosen from the "Choose Signal" menu.

Actual status: The current status of the signal; Off or On.

SECTION 4

MAINTENANCE AND SERVICE



WARNING

GENERAL HAZARD

Before starting of maintenance and service to this equipment, read the "Essential instructions" on the inside cover and the Safety Summary beginning on page P-2. Failure to follow the safety instructions could result in serious injury or death.



WARNING

ELECTRICAL SHOCK HAZARD

Do not operate without covers secure.

Do not open while energized.



Disconnect power to the module(s) prior to replacing components.



This equipment should not be adjusted or repaired by anyone except properly qualified service personnel.

WARNING

UNAUTHORIZED SUBSTITUTION OF COMPONENTS

Tampering with or unauthorized substitution of components may adversely affect the safety of this instrument. Use only factory documented/approved components for repair.

Because of the danger of introducing additional hazards, do not perform any unauthorized modification to this instrument!

CAUTION

PRESSURIZED ENCLOSURE

This enclosure shall not be opened unless the area is known to be free of flammable materials or unless all devices within have been de-energized.

This equipment should not be adjusted or repaired by anyone except properly qualified service personnel!

4-1 OVERVIEW

This section contains instructions and procedures for troubleshooting and maintaining the HFID analyzer module.

The HFID Analyzer Module requires very little maintenance during normal operation.

The gas path system should be leak tested at least twice a year and after maintenance, replacement or repair of gas path parts.

Several components may require replacement. These are discussed in the following sections.

Tag each connector and its location before disconnecting any wiring. This helps in reassembly.

To access the internal components of the analyzer module, perform the following:

1. Remove power to the unit; shut off gases and disconnect lines. Allow module to cool.
2. Refer to Figure 4-1. Remove the six screws securing the front panel, then the six screws securing the cover to the rear panel. Slide cover towards rear panel to remove. Loosen four screws securing inner insulation shield to base, lift up to remove.

Figure 4-2 illustrates the locations of major components of the HFID.

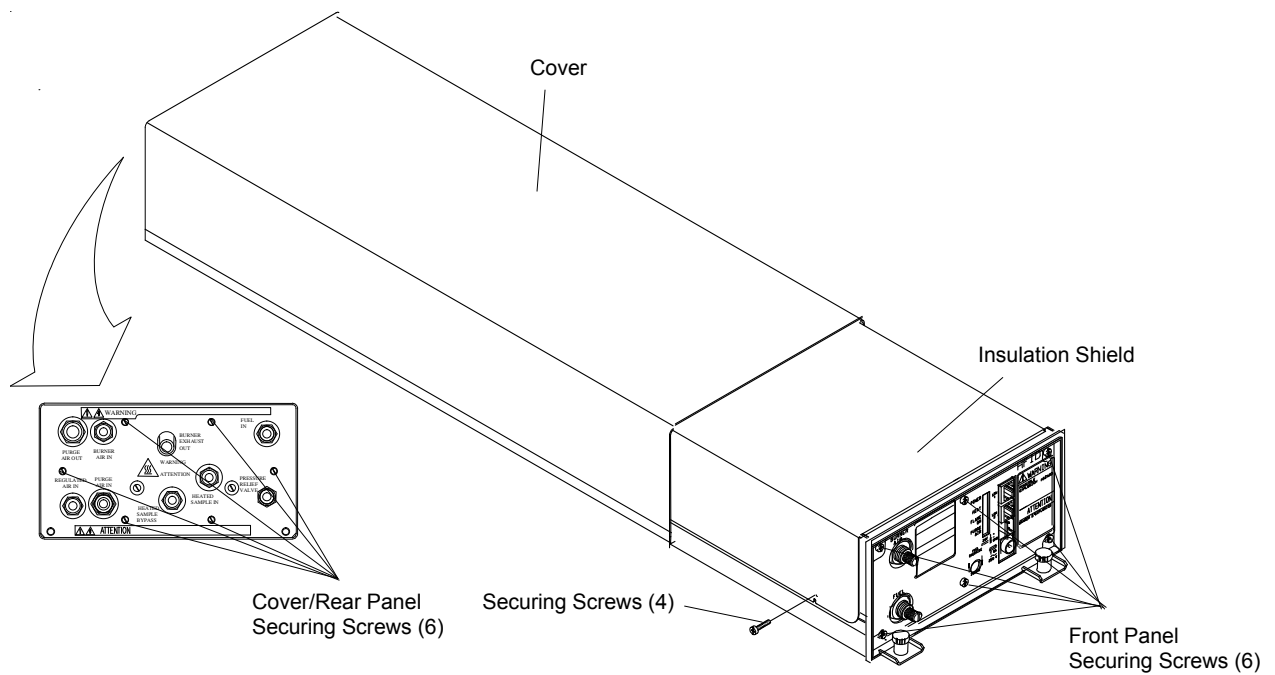


Figure 4-1: Removal of Cover and Insulation Shield

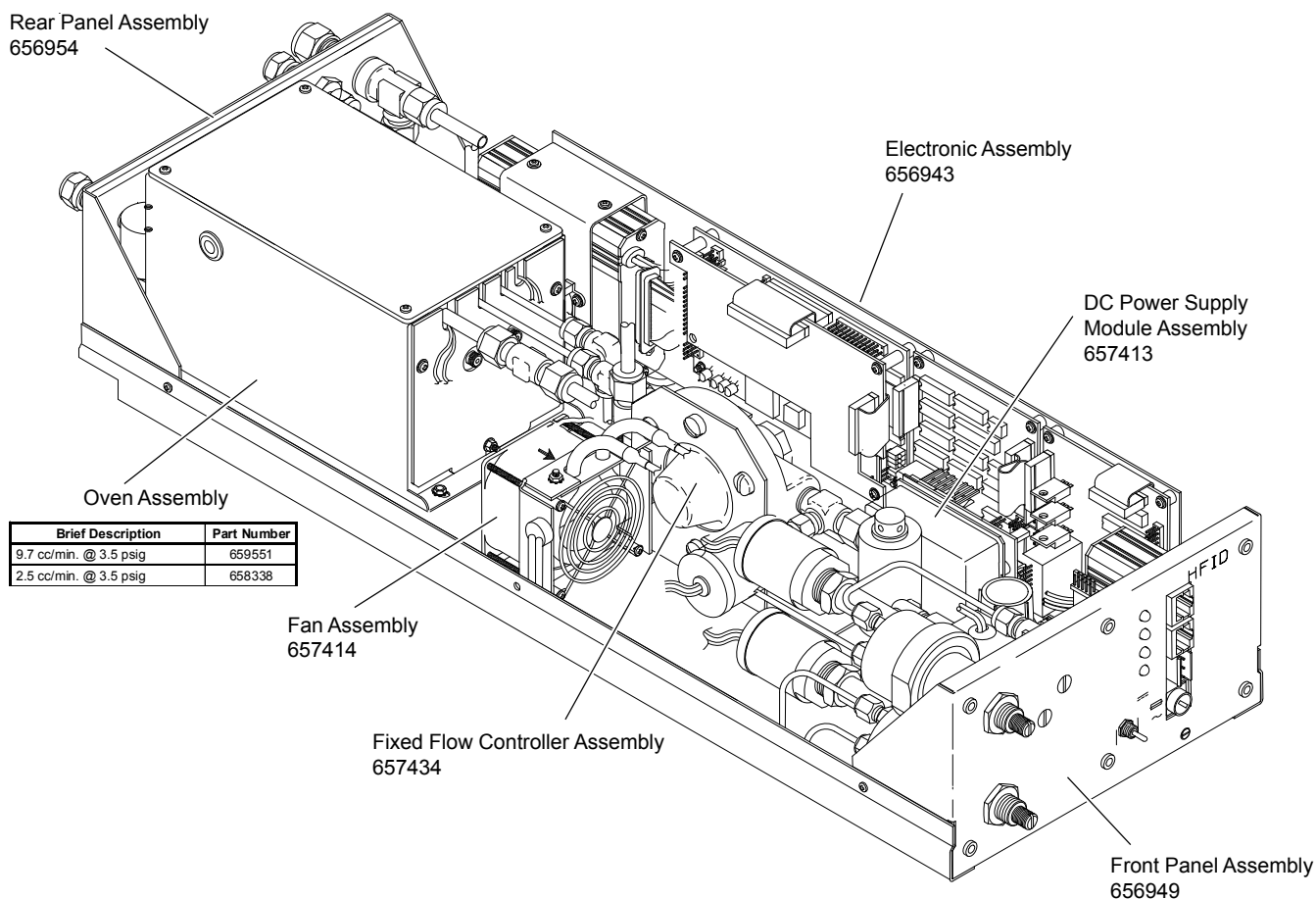


Figure 4-2: Location of Major Assemblies of the HFID Module

4-2 FUSES

The main power fuse may require replacement.

NOTE

Before replacing the fuse, remove power to the Analyzer Module.

See figure 2-3 for the location of the main power fuse [T 6A 250 V (6x32 mm)], which protects 24 VDC input to the module.

NOTE

Use only fuses of the correct type and current ratings as replacements. Using repaired fuses and short circuiting of fuse holders is prohibited.

4-3 OVEN

Though the oven can be replaced as a complete unit, all internal components are field replaceable.

a. Removal

Refer to Figure 4-3, disconnect the oven's three gas lines and seven electrical cables, noting location of mating connectors for re-installation.

NOTE

DO NOT remove the fittings from the gas lines on the detector.

Remove the two hex nuts securing the oven to the chassis and the two screws securing oven to the rear panel. Lift oven assembly from analyzer.

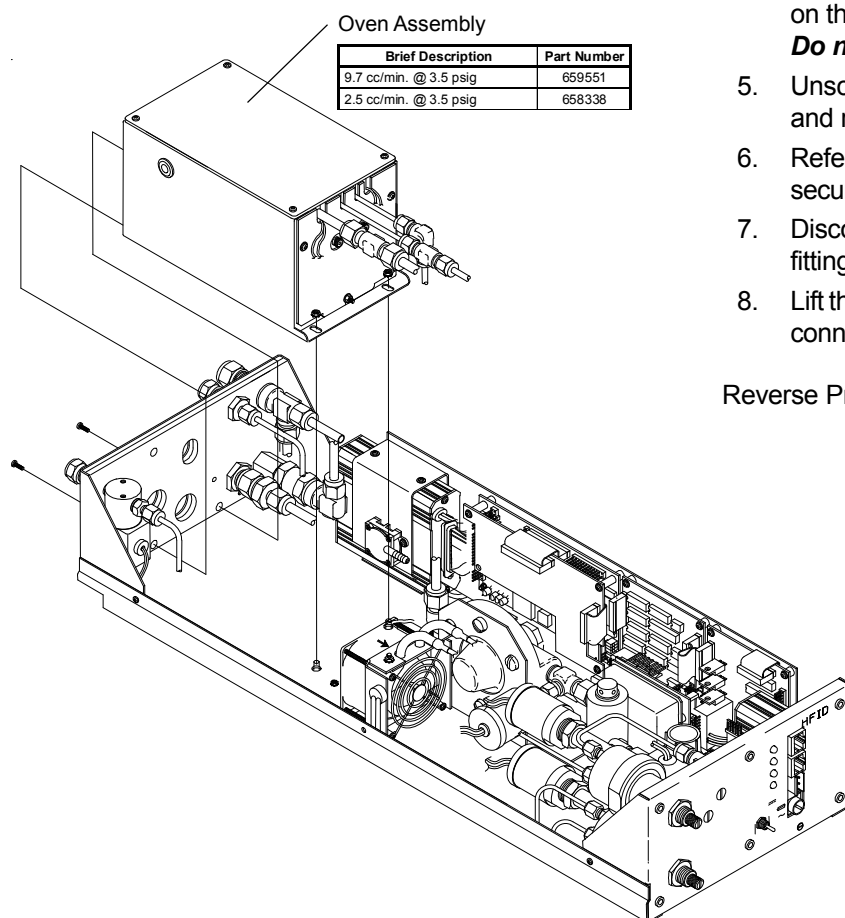


Figure 4-3: Removal of Oven from Chassis

b. Disassembly

1. Refer to Figure 4-4A. Remove the four retaining screws on the oven cover, remove cover.
2. Remove the two screws and one nut securing the outer oven front panel to the outer oven, remove front panel.
3. Remove the nuts and ferrules from sample in and sample bypass out.

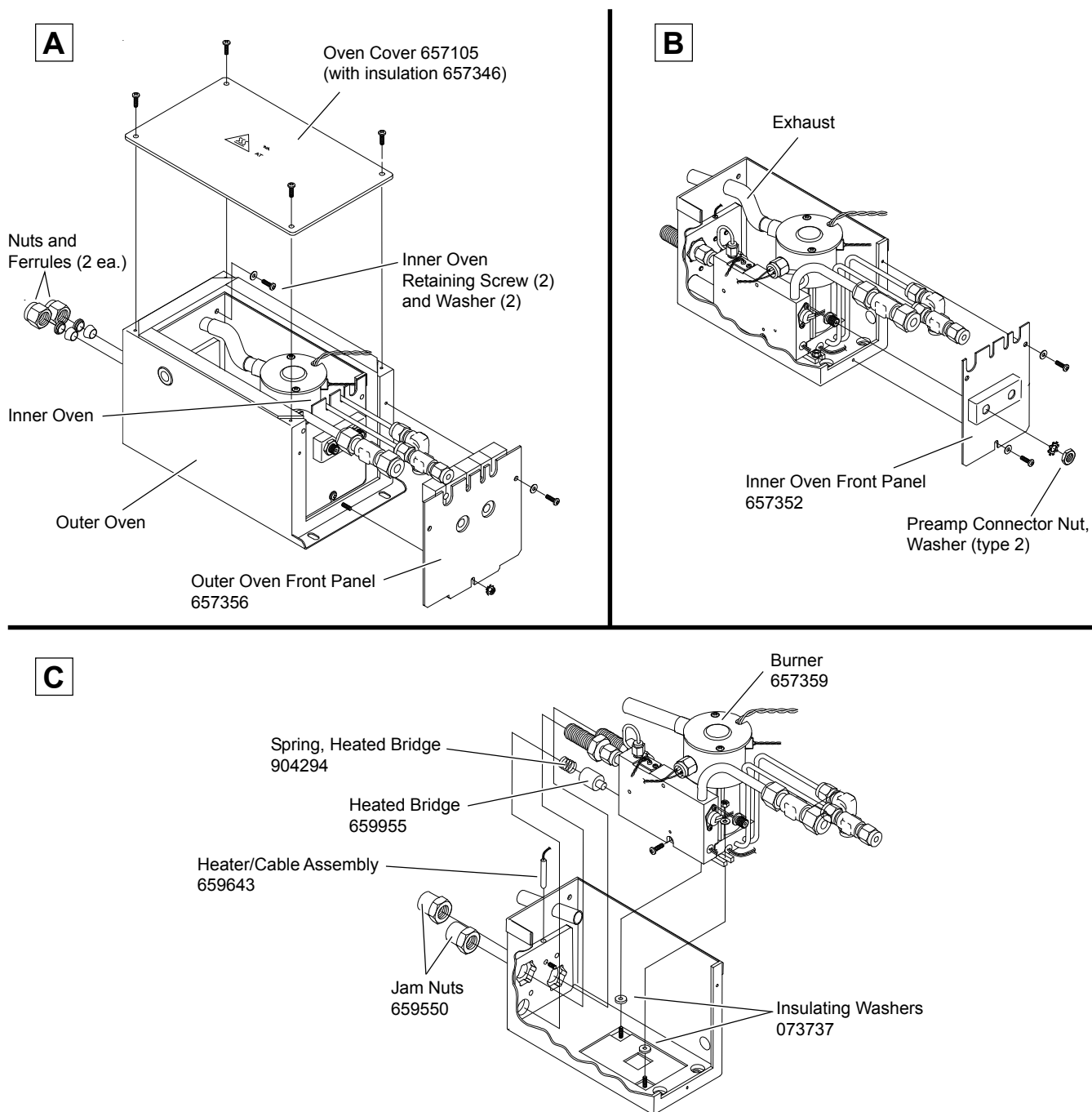
CAUTION

PREAMP CONNECTORS !

The electrical preamp connectors are fragile, handle with care to avoid breaking solder connection!

4. Refer to Figure 4-4B. Remove the two nuts and washers from the electrical preamp connectors on the inner oven front panel.
Do not unsolder these connections.
5. Unscrew the three screws from inner front panel and remove it.
6. Refer to Figure 4-4C. Remove the two hex nuts securing the burner to the bottom of the inner oven.
7. Disconnect the sample input and output bypass fittings.
8. Lift the burner/thermal block up and out, while disconnecting exhaust.

Reverse Procedure for installation.



For clarity, outer oven not shown in Figures B and C.

Figure 4-4: Oven Assembly

4-4 BURNER

This section covers burner components which can be replaced without removal of oven from the chassis.

a. Temperature Sensor

1. Refer to Figure 4-4A. Remove the four screws on the oven cover, remove cover.
2. Refer to figure 4-5. Remove the burner cap retainer.
3. Disconnect the temperature sensor wiring connector, note location.
4. Remove the temperature sensor.
5. Insert replacement sensor.

NOTE

The leads of the temperature sensor must be leading away and down from the sensor to enable proper fit of burner cap retainer.

6. Install the burner cap retainer. U-slot must be located above temperature sensor.
7. Re-attach wiring connector.
8. Install oven cover.

b. RTD Detector

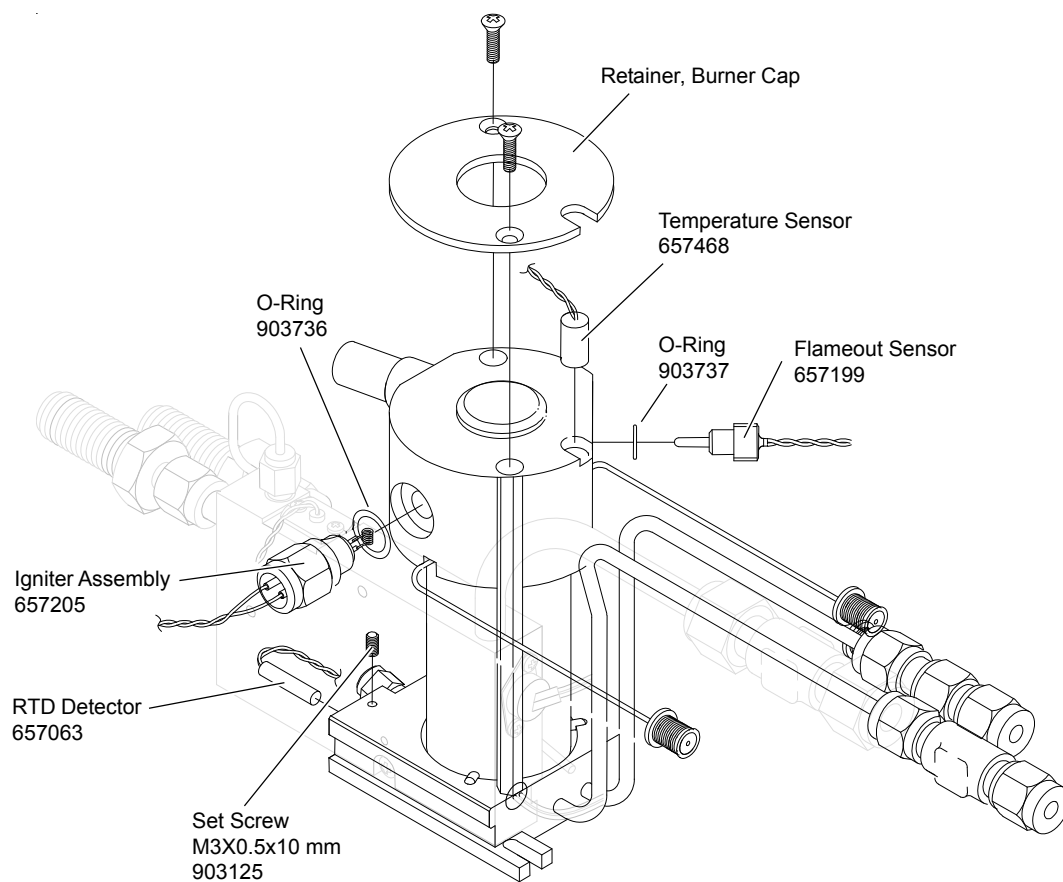
1. Refer to Figure 4-4A. Remove the four screws on the oven cover, remove cover.
2. Refer to Figure 4-5. Loosen the set screw securing RTD detector.
3. Disconnect RTD detector wiring connector, note location.
4. Gently grasp RTD detector wires and pull out of hole.
5. Insert replacement RTD detector into hole, snug down set screw.
6. Re-attach wiring connector.
7. Install oven cover.

c. Igniter

1. Refer to Figure 4-4A. Remove the four screws on the oven cover, remove cover.
2. Refer to Figure 4-5. Disconnect the Igniter wiring connector, note location.
3. Using an open-end wrench, unscrew the igniter assembly from the burner. Verify that o-ring is also removed.
4. Install replacement igniter and new o-ring. Using open-end wrench, snug down.
Do not over-tighten!
5. Re-attach wiring connector.
6. Install oven cover

d. Flameout Sensor

1. Refer to Figure 4-4A. Remove the four screws on the oven cover, remove cover.
2. Refer to Figure 4-5. Disconnect the flameout detector wiring connector, note location.
3. Lift up the burner cap until flameout sensor is accessible. Using an open-end wrench, unscrew the flameout detector from the burner. Verify that o-ring is also removed.
4. Install replacement flameout detector and new o-ring. Using open-end wrench, snug down.
Do not over-tighten!
5. Re-attach wiring connector.
6. Install oven cover.



The components shown can be replaced without removing burner/thermal block from oven.
Oven not shown for clarity.
Thermal block shown in phantom for clarity.

Figure 4-5: Burner-Sensor, Flameout Detector, RTD Detector and Igniter

4-5 BURNER INTERNAL COMPONENTS

CAUTION

BURNER CONTAMINATION

Do not handle internal parts of the burner with bare hands. All tools used for maintenance must be free of contaminants.

a. Disassembly of Burner / Thermal Block

1. Remove oven from analyzer module per Section 4-3a.
2. Remove burner / thermal block from oven per Section 4-3b.
3. Refer to Figure 4-6. Disconnect sample capillary nut at base of burner.
4. Remove screw securing thermal block to burner.
5. Carefully pull burner away from thermal block.

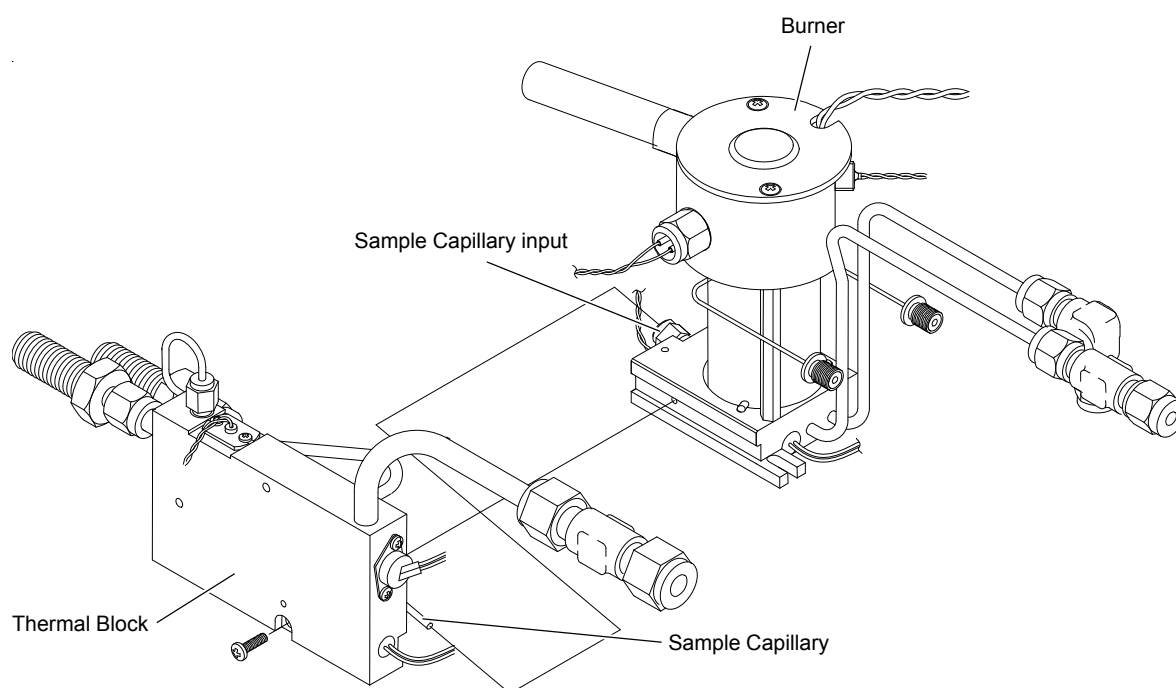


Figure 4-6: Burner/Thermal Block Disassembly

b. Replacing Burner Jets

Disassemble the burner only if contaminants are evident. Combustion products or other contaminants which accumulate inside the burner may form electrical leakage paths between the collector and the burner contact, resulting in noisy readings.

If the analyzer module is to be operated at the highest sensitivity, traces of such contaminants can cause erroneous readings.

CAUTION

BURNER CONTAMINATION

Do not handle internal parts of the burner with bare hands. All tools used for maintenance must be free of contaminants.

For best performance, replace the burner jet as follows:

1. Remove oven from analyzer module per Section 4-3a.
2. Remove burner / thermal block from oven per Section 4-3b.
3. Remove thermal block from burner per Section 4-5a.
4. Refer to Figure 4-7A. Remove screws (2) holding burner cap retainer, remove retainer.
5. Holding burner base, lift burner cap off assembly, set aside, remove gasket.
6. Refer to Figure 4-7B. Holding burner base, lift combustion chamber off, set aside.

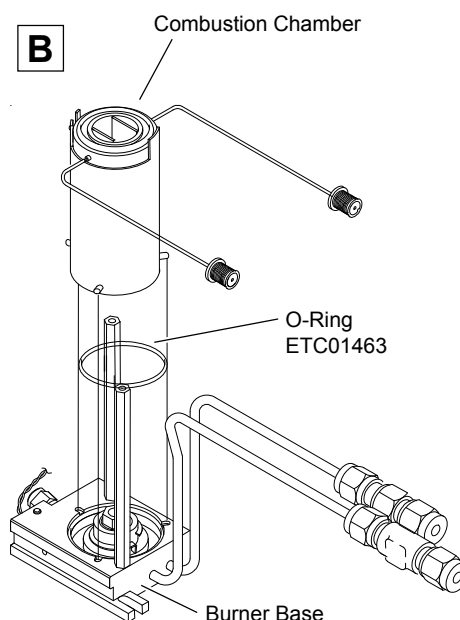
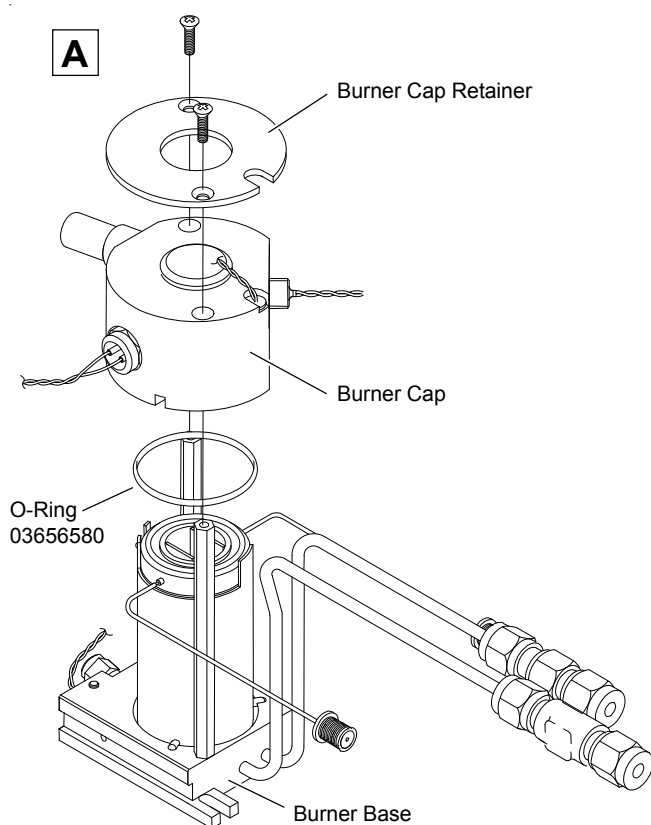


Figure 4-7: Burner Disassembly

7. Refer to Figure 4-8. Lift air baffle out of burner base.
8. Remove the sample jet and gasket from the bottom of the burner base.
9. Remove the jet nut. Grasp jet assembly and lift out (along with upper gasket) of burner base. Remove bottom gasket.

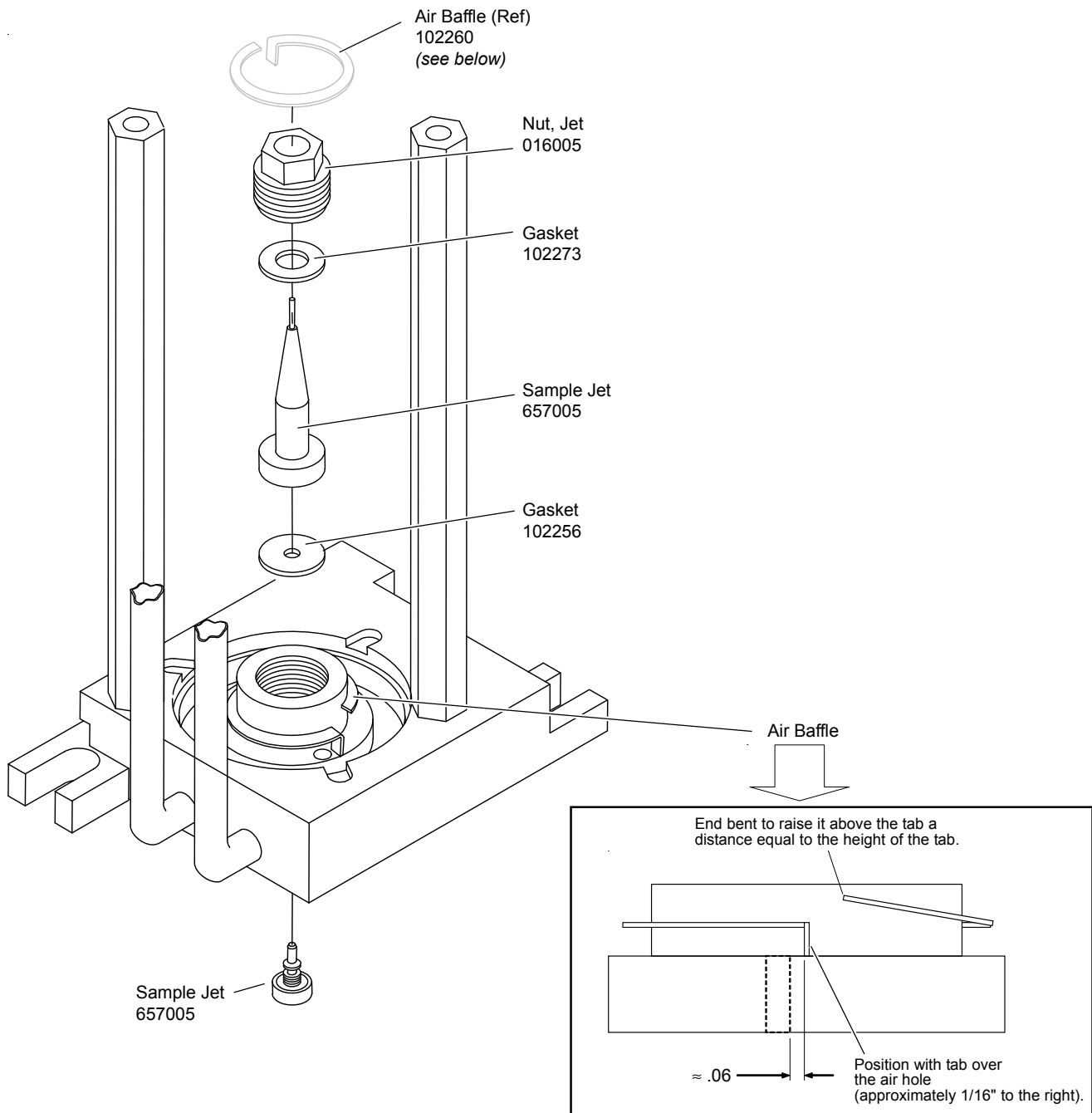


Figure 4-8: Burner Jets

c. Burner Jet Installation

CAUTION

BURNER CONTAMINATION

Do not handle internal parts of the burner with bare hands. All tools used for maintenance must be free of contaminants.

1. Install new lower gasket, jet assembly and upper gasket into burner base, finger-tight jet nut.
2. Install new sample jet (with gasket) and tighten.
3. Tighten jet nut.
4. Install air baffle per Figure 4-8.

NOTE

Incorrect installation of air baffle will cause ignition failure.

5. See Figure 4-7B. Insert new o-ring into burner base.
6. Set combustion chamber into burner base **being careful not to move air baffle.**
7. See Figure 4-7A. Insert new gasket on combustion chamber, install burner cap and burner cap retainer, torque screws to 6 inch lbs.

4-6 THERMAL BLOCK

The sample RTD can be replaced with the thermal block attached to burner and mounted in oven. The cartridge heater and thermostat are also replaceable with thermal block secured to burner, but must be removed from the oven.

a. Sample RTD

1. Refer to Figure 4-4A. Remove the four screws securing the oven cover, remove cover.
2. Disconnect the sample RTD wiring connector, note location.
3. Refer to Figure 4-9. Remove the two screws securing the sample RTD, pull sample RTD out.
4. Install replacement sample RTD, secure with screws.
5. Attach sample RTD wiring connector.
6. Re-attach oven cover.

b. Cartridge Heater

1. Remove oven from analyzer module per Section 4-3a.
2. Remove burner / thermal block from oven per Section 4-3b.
3. Refer to Figure 4-9. Loosen retaining set screw, pull out cartridge heater.
4. Install replacement cartridge heater, snug down set screw.
5. Install burner / thermal block into oven.
6. Install oven into analyzer module.

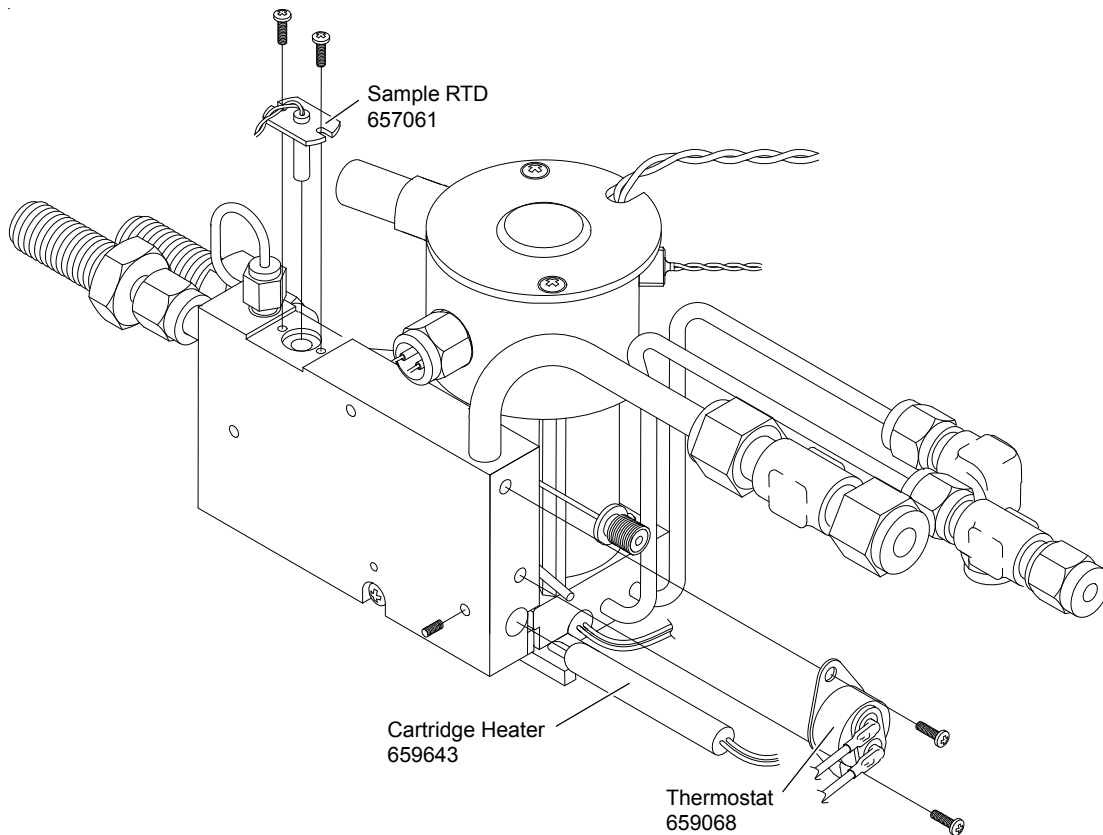


Figure 4-9: Thermal Block- Sample RTD, Cartridge Heater and Thermostat

c. Thermostat

1. Remove oven from analyzer module per Section 4-3a.
2. Remove burner / thermal block from oven per Section 4-3b.
3. Refer to Figure 4-9. Remove the two retaining screws, pull thermostat out.
4. Install replacement thermostat, attach with the two retaining screws.
5. Install burner / thermal block into oven.
6. Install oven into analyzer module.

d. Sample Capillary

1. Remove oven from analyzer module per Section 4-3a.
2. Remove burner / thermal block from oven per Section 4-3b.
3. Remove burner from thermal block per Section 4-5a.
4. Refer to Figure 4-10. Remove the two screws securing the capillary cover to thermal block, remove cover.
5. Remove capillary nut, remove capillary.
6. Install replacement capillary.
7. Insert capillary into thermal block. The capillary may require bending to fit.
8. Install cover.

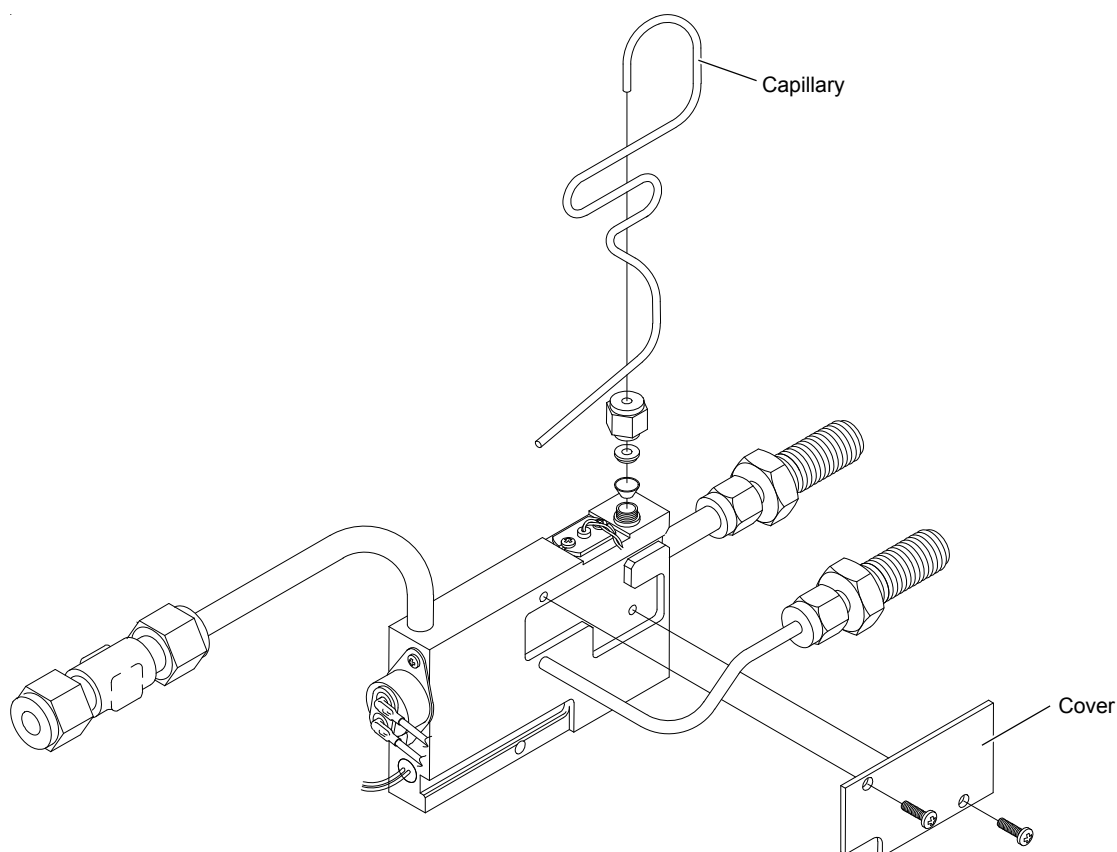


Figure 4-10: Thermal Block Assembly

4-7 ELECTRONICS ASSEMBLY



CAUTION

ELECTROSTATIC DISCHARGE

The electronic parts of the Analyzer Module can be irreparably damaged if exposed to electrostatic discharge (ESD).

The instrument is ESD protected when the covers have been secured and safety precautions observed. When the housing is open, the internal components are not ESD protected anymore.

The electronics assembly must be removed from the chassis of replacement of any of the following components is necessary:

- Power Supply Board
- Safety Board
- Computer Analysis Board
- Preamplifier Assembly
- Sensor Board
- Case Temperature Sensor
- Case Pressure Switch

1. Remove the hex nut and screw as shown in Figure 4-11.
2. Lay electronics assembly on bench, do not disconnect cables or tubing.

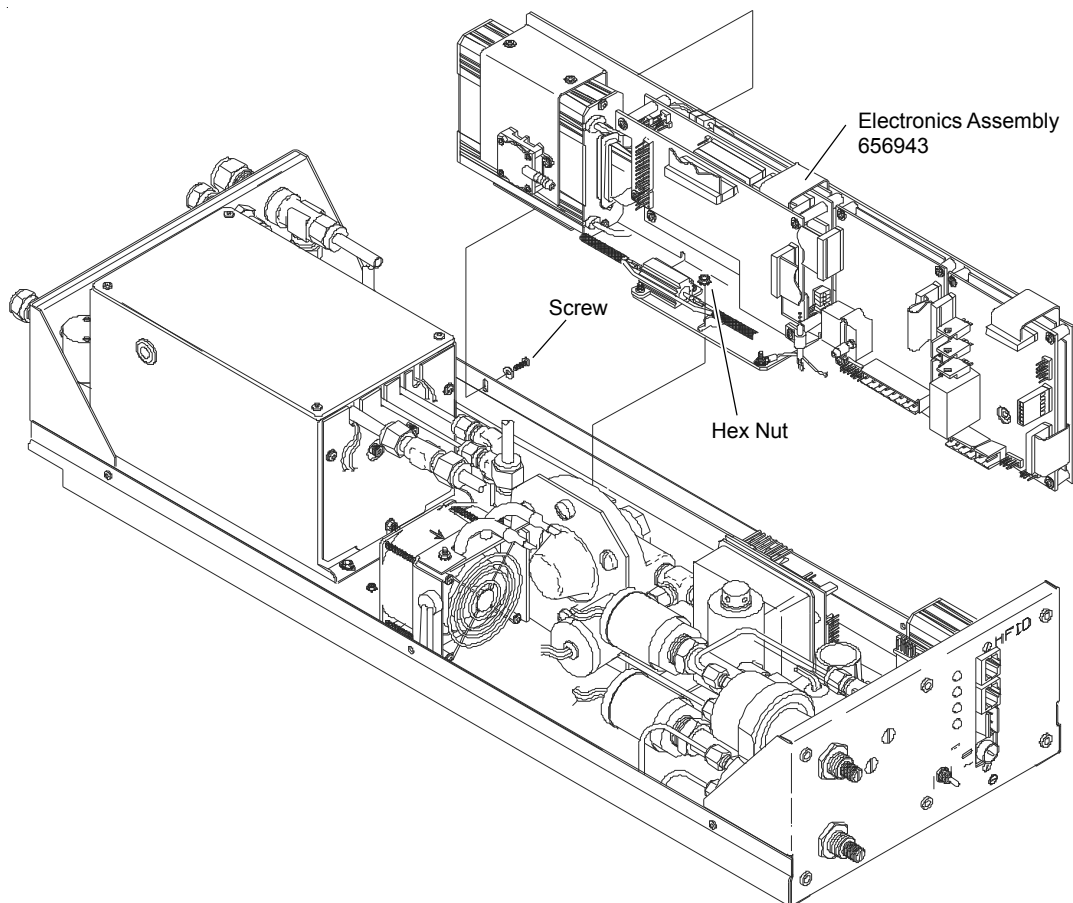


Figure 4-11: Removing Electronics Assembly from Chassis

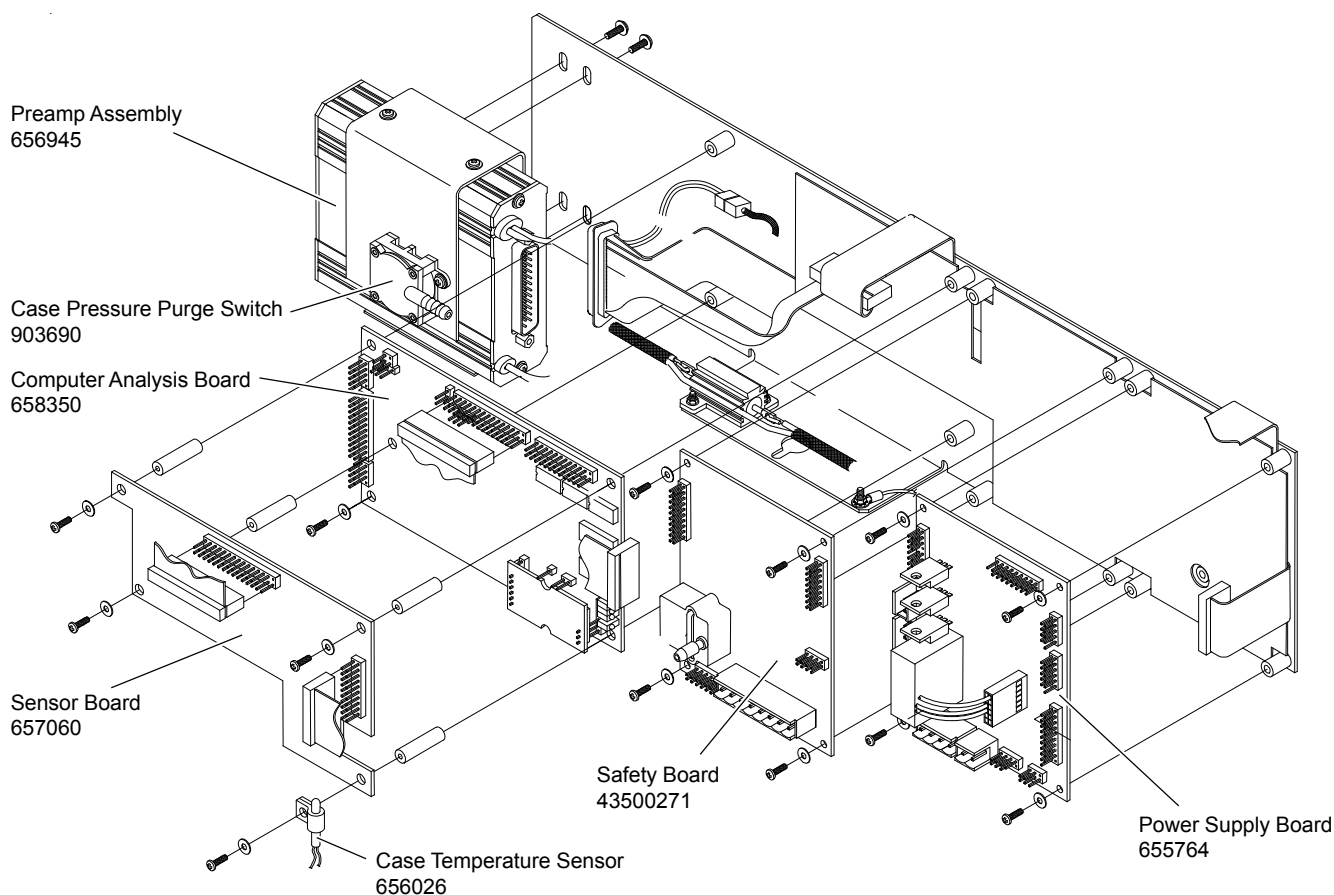


Figure 4-12: Electronics Assembly - Exploded View

a. Printed Circuit Boards

When replacing a circuit board, the following procedure is recommended:

Per Section 4-7, remove securing hardware from electronics assembly and lay on bench.

Remove securing hardware from printed circuit board to be replaced, do not disconnect cable(s).

One at a time, remove the wiring connectors and attach to replacement board.

Mount replacement board to electronics assembly.

b. Case Temperature Sensor

1. Per Section 4-7, remove securing hardware from electronics assembly and lay on bench.
2. Disconnect case temperature sensor cable.
3. Remove screw securing cable clamp holder to signal board.
4. Remove case temperature sensor from cable clamp holder.
5. Per Figure 4-13 insert replacement case temperature sensor into cable clamp holder.
6. Re-assemble to signal board mounting screw.

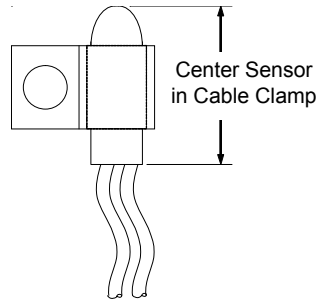


Figure 4-13: Case Temperature Sensor Installation

c. Case Pressure Purge Switch

1. Per Section 4-7, remove securing hardware from electronics assembly and lay on bench.
2. Disconnect the two electrical terminals, note location.
3. Disconnect tube at pressure switch.
4. Remove mounting screws (2) and washers (2).
5. Reverse procedure for installation of replacement switch.

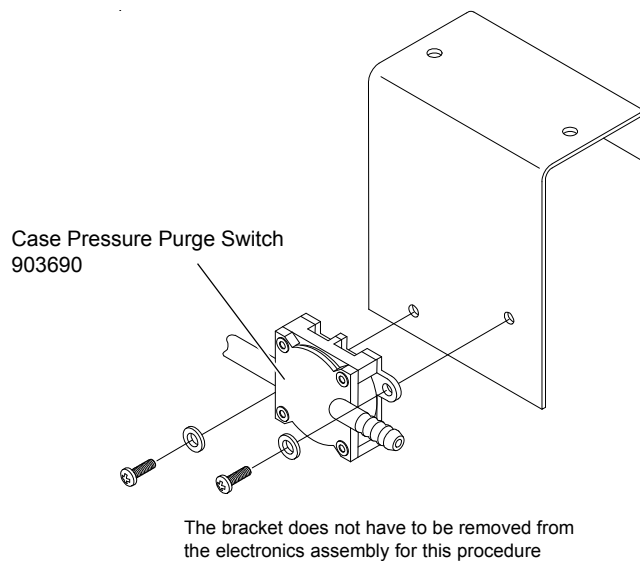


Figure 4-14: Case Pressure Purge Switch Installation

d. Preamp Assembly

1. Per Section 4-7, remove securing hardware from electronics assembly and lay on bench.
2. Disconnect and note location of cables.
3. Remove the two screws and washers from the top bracket and slide the preamp assembly out.
4. Remove the lower bracket from the preamp assembly and install on replacement preamp assembly.
5. Slide replacement preamp assembly into top bracket and secure with mounting hardware.
6. Re-connect cables.

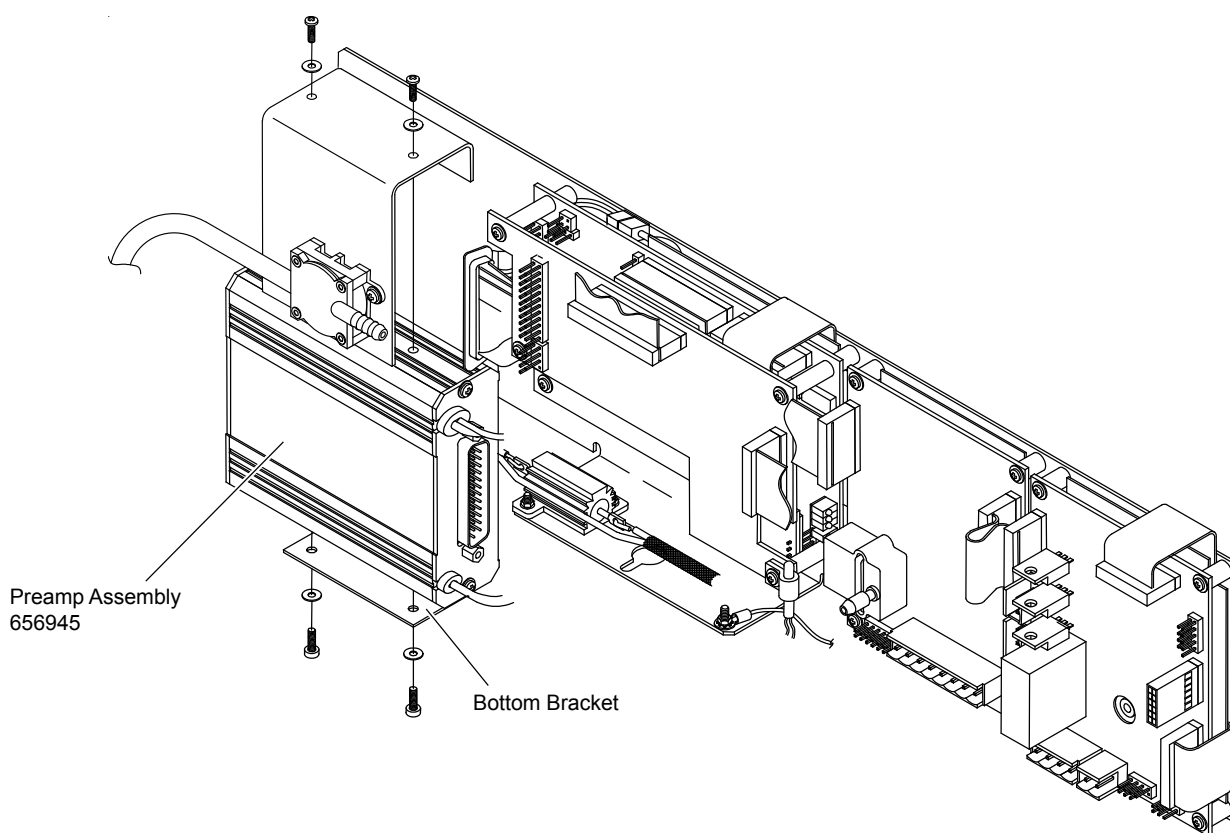


Figure 4-15: Preamp Assembly Installation

4-8 FAN ASSEMBLY

1. Disconnect and note location of cables.
2. Remove the two hex nuts securing the fan to the chassis, lift fan assembly out.

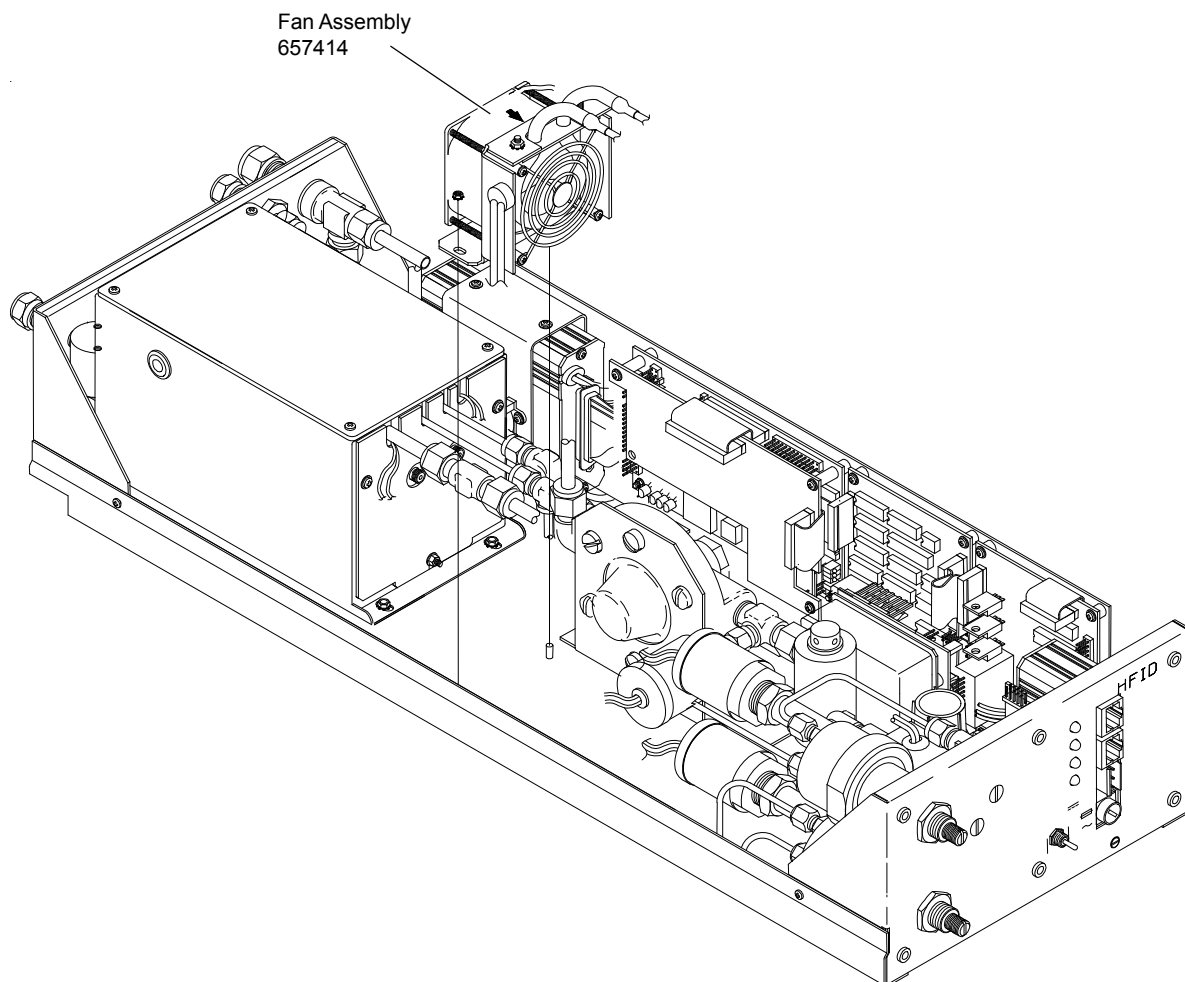


Figure 4-16: Fan Assembly Installation

4-9 FLOW CONTROLLER

1. Disconnect the all tubing and wiring connectors, note locations.
2. Remove the four hex nuts securing the flow controller assembly to the analyzer module chassis.

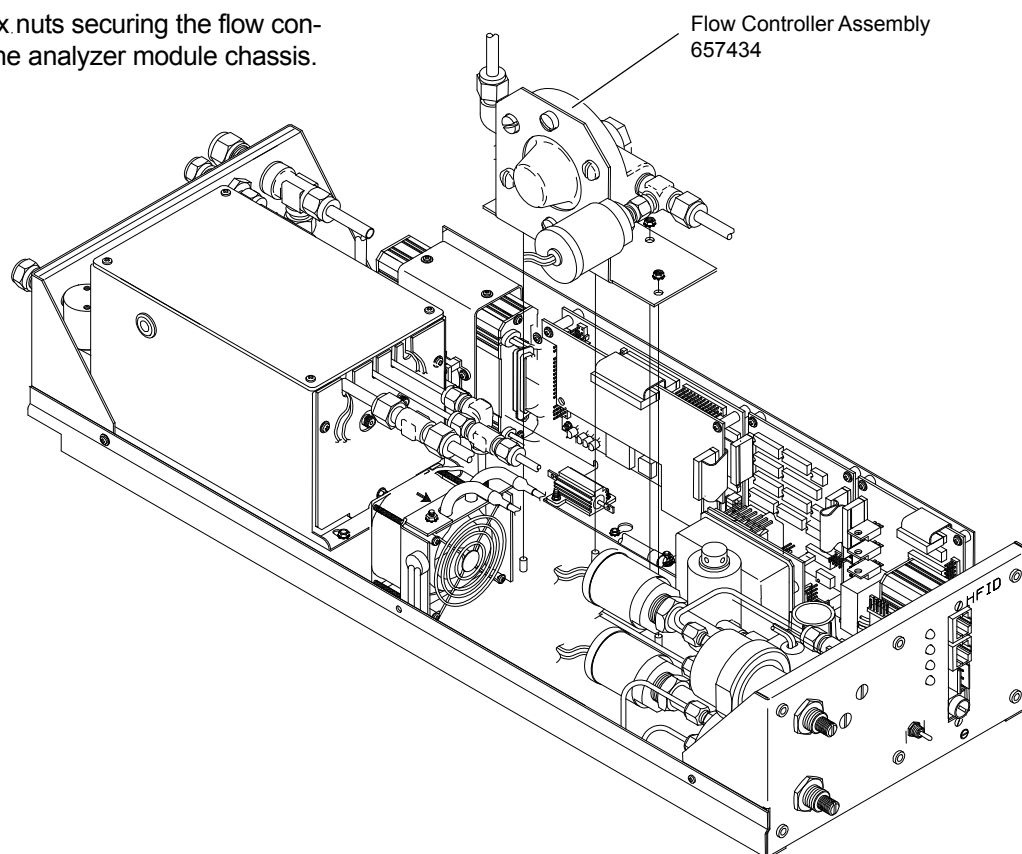
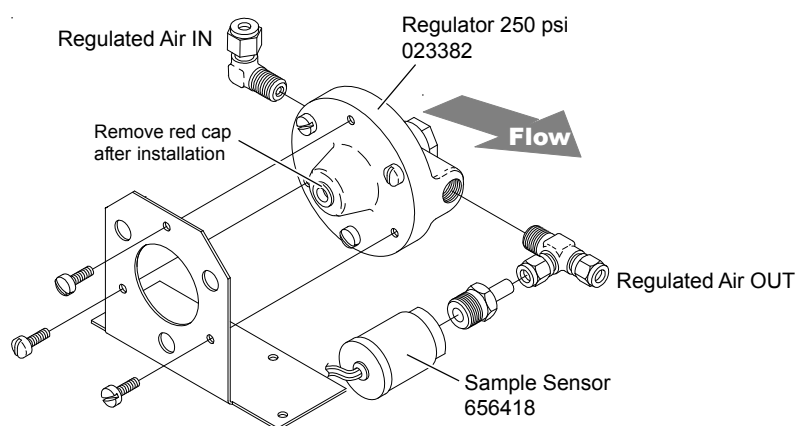


Figure 4-17: Flow Controller Replacement



Remove and discard bracket supplied with regulator, assembly as shown.

Figure 4-18: Flow Controller Assembly

4-10 DC POWER SUPPLY MODULE

1. Disconnect and note location of all wiring to DC power supply module.
2. Remove the two hex nuts securing module to chassis, remove module.

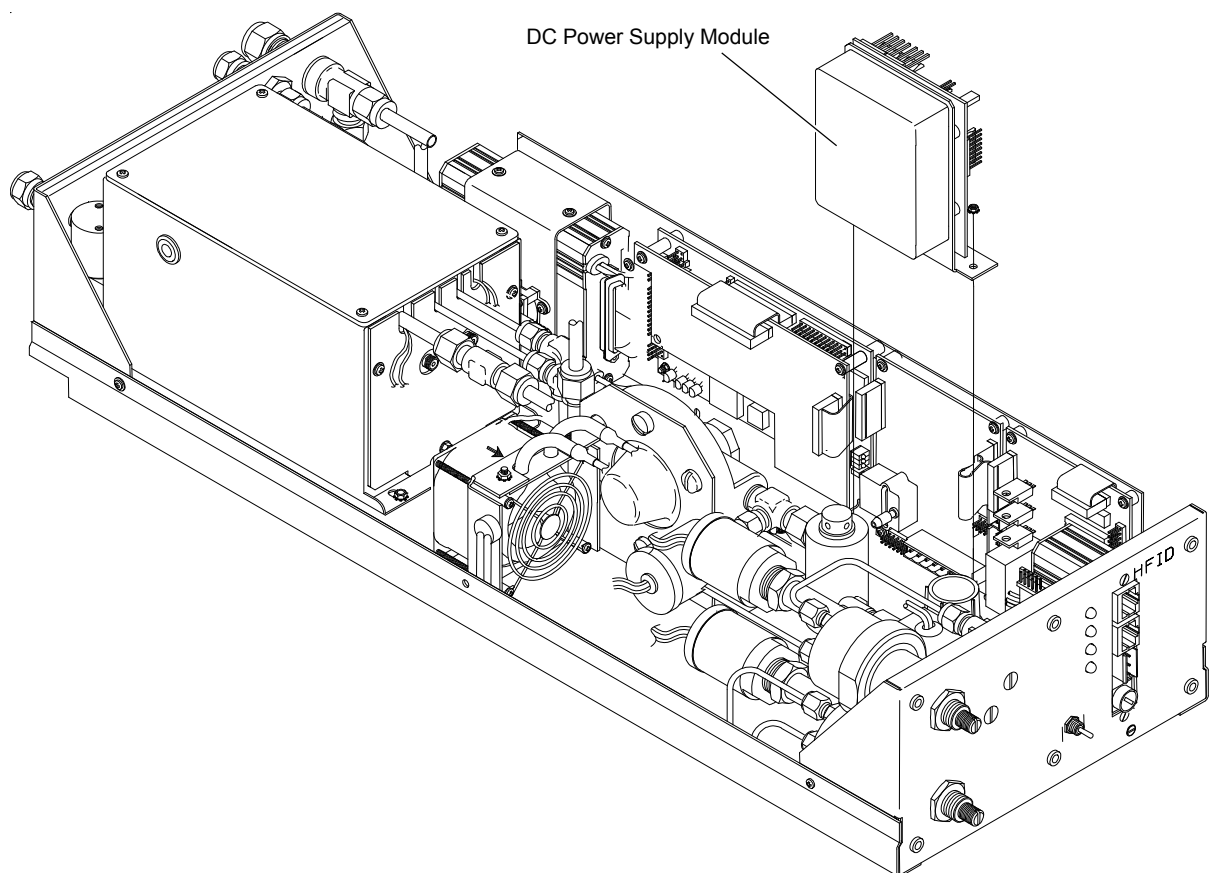


Figure 4-19: DC Power Supply Module Replacement

4-11 FRONT PANEL COMPONENTS

The following components are mounted to the front panel:

- LON/Power Module
- Manual Ignite Toggle Switch
- LED Indicator Assembly
- Purge Air Regulator
- Purge Air Flow Switch
- Burner Air Solenoid Valve
- Burner Air Regulator
- Fuel Regulator
- Burner Air Sensor
- Fuel Sensor
- Air Ignite Restrictor
- Air Measurement Restrictor

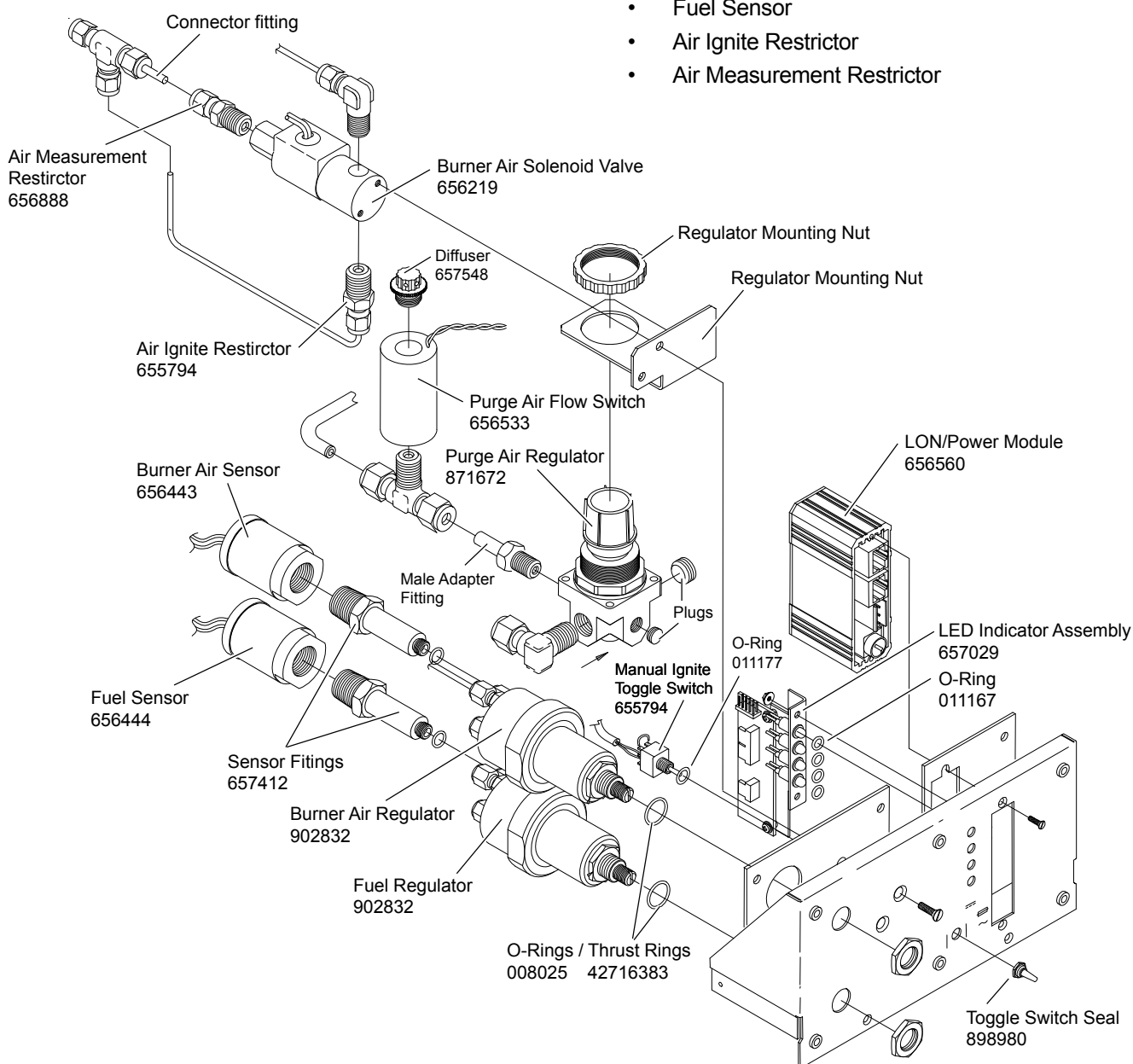


Figure 4-20: Front Panel - Exploded View

Replacing Front Panel Components

1. To access components, remove the four front panel mounting screws (two on front, one on each side).
2. Remove the burner air regulator and fuel regulator mounting nuts.

3. Remove the purge air regulator mounting bracket screws.

The front panel can now be pulled away from the chassis.

NOTE

The wiring from front panel components is still connected. Do not disconnect unless replacing that component.

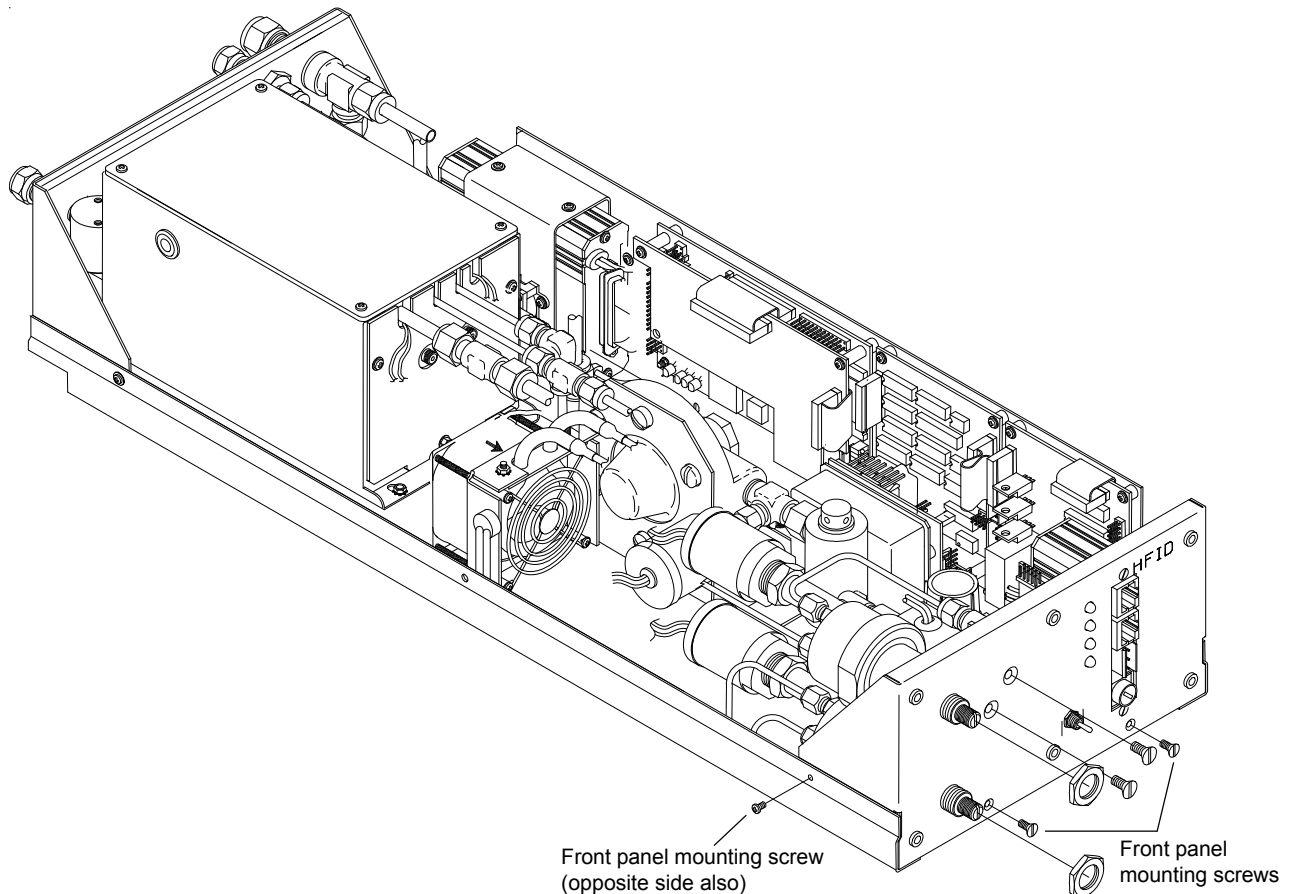


Figure 4-21: Accessing Front Panel Components

a. LON/Power Module

1. Disconnect wiring connectors, note locations.
2. Refer to Figure 4-20. From the outside of the front panel, remove the two mounting screws.
3. Install replacement module in reverse order.

b. LED Indicator Assembly

1. Disconnect wiring connector, note location.
2. Refer to Figure 4-20. From the inside of the front panel, remove the two hex nuts securing LED indicator assembly to front panel. Remove indicator assembly and o-rings (four).
3. Inspect o-rings for damage, replace if necessary. Install o-rings on replacement indicator assembly, mount assembly on mounting studs with hex nuts.
4. Re-connect wiring connector.

c. Manual Ignite Toggle Switch

1. Disconnect wiring connector, note location.
2. Refer to Figure 4-20. From the outside of the front panel, remove the toggle switch seal.
3. Pull the switch and o-ring out from inside the front panel.
4. Inspect o-ring for damage, replace if necessary. Install o-ring on replacement switch, insert through front panel from the inside.
5. Install switch seal.
6. Re-connect wiring connector.

d. Burner Air Sensor

1. Disconnect wiring connector, note location.
2. Using an open-end wrench to hold the sensor fitting while using another open-end wrench to remove the sensor.
3. Replace the Teflon pipe thread tape on the treads of the sensor fitting.
4. Install sensor onto sensor fitting.
5. Re-connect wiring connector.

e. Fuel Sensor

1. Disconnect wiring connector, note location.
2. Using an open-end wrench to hold the sensor fitting while using another open-end wrench to remove the sensor.
3. Replace the Teflon pipe thread tape on the treads of the sensor fitting.
4. Install sensor onto sensor fitting.
5. Re-connect wiring connector.

f. Burner Air and Fuel Regulator

1. Disconnect the two tubes and the sensor fitting on the rear of the regulator, note locations.
2. Replace the Teflon pipe thread tape on the threads of the sensor fitting.
3. Remove the regulator and o-ring.
4. The replacement regulator comes with two panel mounting nuts, remove both and discard one of them.
5. Inspect o-ring for damage, replace if necessary. Install o-ring onto regulator threaded shaft.
6. Insert regulator into front panel, secure with mounting nut.
7. Re-attach the three tubes.

g. Purge Air Regulator

1. Remove the regulator mounting nut, remove mounting bracket.
2. Loosen nut on tee fitting attached to purge air flow switch.
3. Disconnect tube at elbow, remove regulator.
4. Remove the two plugs, elbow and male adapter fittings from the regulator.
5. Replace the Teflon pipe thread tape on the two plugs, the elbow and the male adapter and install into replacement regulator.
6. Connect tube to elbow, insert male adapter into tee fitting.
7. Install mounting bracket onto regulator, hand snug mounting nut.
8. Attach mounting bracket to front panel, tighten regulator mounting nut.

h. Purge Air Flow Switch and Diffuser

1. Unscrew flow switch from tee fitting.
2. Replace Teflon pipe thread tape on tee fitting.
3. Remove diffuser from flow switch and install into replacement flow switch.
4. Install replacement flow switch.
5. Install purge switch onto tee fitting.
6. Re-connect tubes.

i. Burner Air Solenoid Valve

1. Disconnect the tube at the top elbow fitting.
2. Disconnect the tube at the tee fitting, remove valve analyzer module.
3. Holding the air ignite restrictor, unscrew the solenoid valve.
4. On the solenoid valve, remove the connector fitting.
5. Replace the Teflon pipe thread tape on the elbow, connector and restrictor.
6. Verify replacement solenoid valve wires (flat side of body) are exiting on the same side as the COM port as shown in Figure 4-20. If not, use an open-end wrench to hold the N.O. hex port while rotating body.
7. Install air ignite restrictor into N.C. port.
8. Install elbow into COM port and connector fitting into N.O. port.
9. Re-connect tubes.

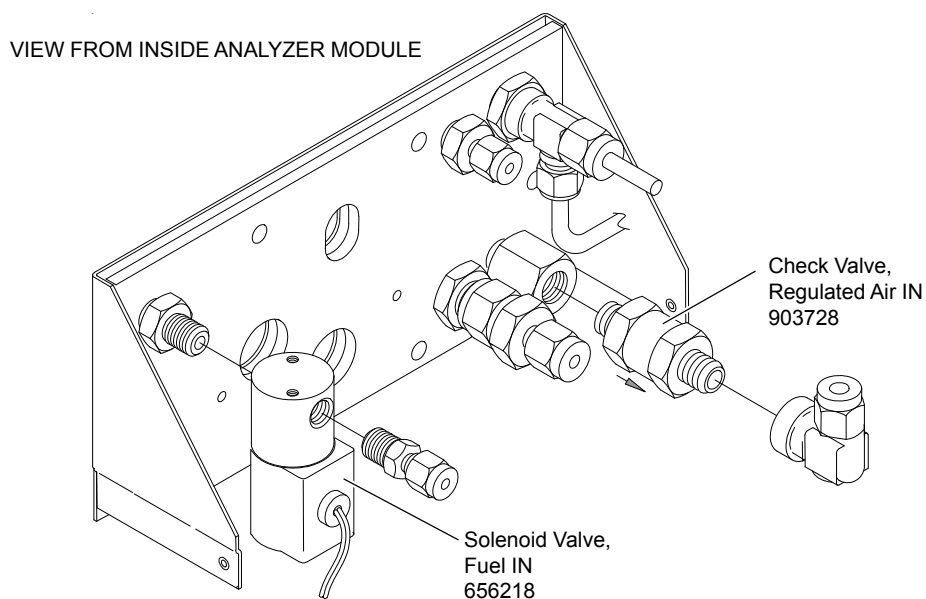
j. Air Ignite Restrictor

1. On the burner air solenoid valve:
 - a. Disconnect the tube at the top elbow fitting.
 - b. Disconnect tube at tee fitting.
 - c. Lift solenoid valve from analyzer module.
 - d. Disconnect tube going to air ignite restrictor.
 - e. Remove restrictor from solenoid valve.
2. Add Teflon pipe thread tape to replacement restrictor, install into solenoid.
3. Re-connect tubes to restrictor, elbow and tee fitting.

4-12 REAR PANEL COMPONENTS

The following components are mounted to the rear panel:

- Fuel In 2-Way Solenoid Valve
- Regulated Air In Check Valve
- Burner Air In Filter
- Heated Sample Bypass Out Restrictor
- Heated Sample In Restrictor



VIEW FROM OUTSIDE ANALYZER MODULE

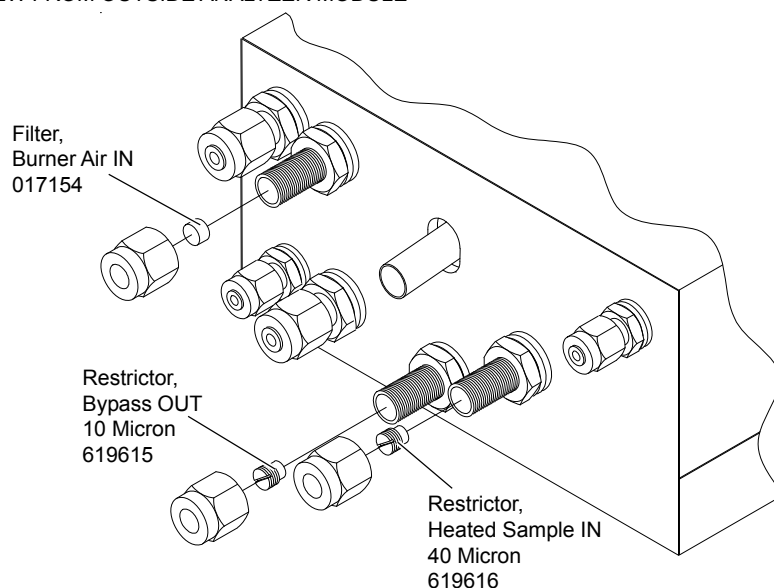


Figure 4-22: Rear Panel Components

a. Fuel In 2-Way Solenoid Valve

1. Disconnect wiring solenoid valve wiring connector, note location.
2. Inside the analyzer module, disconnect the tube going to the connector on the "out" port of the solenoid valve.
3. On the rear of the analyzer module at the fuel in port:
 - a. Disconnect the fuel in tube.
 - b. Remove nuts and washers
 - c. Remove solenoid valve from analyzer module
4. Remove the fittings from the solenoid valve and replace the Teflon pipe thread tape.
5. Verify that body of replacement solenoid valve is oriented as shown in Figure 4-22. If not, rotate till wires are in-line with "out" port.
6. Install fittings into replacement solenoid valve, re-install in analyzer module.

b. Burner Air In Filter

1. Leaving the bulkhead fitting secured to the rear panel, remove the tubes, nuts and ferrules from the fitting.
2. Insert a clean, rigid piece of tube or rod (smaller than .25 inch diameter) into the bulkhead fitting to force out the filter disc.
3. Install the replacement filter in the same manner, through the rear of the bulkhead fittings.
4. Re-connect tubes.

c. Heated Bypass Sample Out and Heated Sample In Restrictors

1. On the outside of the rear panel, disconnect tube and remove nut.
2. Insert a small spade screwdriver into the bulkhead and remove the restrictor.
3. Install in reverse order.

d. Regulated Air In Check Valve

1. Disconnect tube at elbow.
2. Remove check valve from female connector.
3. Remove elbow from check valve.
4. Add Teflon pipe thread tape to check valve threads.
5. Install elbow onto check valve.
6. Install check valve into female connector, verifying orientation of elbow fitting as shown in Figure 4-22.

4-13 LEAKAGE TEST

The gas path system should be leak tested at least twice a year and after maintenance, replacement or repair of gas path parts.

a) Required Tools

- Test Medium
- external Manometer
- Swagelok® Blind Unions SS (2)
- Swagelok® Blind Unions brass (2)
- tube piece with rubber stopper

b) Procedure

To perform a leakage testing, proceed as follows (see figure 4-23):

1. Close gas supplies and disconnect the gas connections
2. Close „Fuel IN“, „Burner Air IN“, „Bypass OUT“ and „Regulated Air IN“ with blind unions
3. Close „Exhaust“ with a tube piece with rubber stopper.

4. Connect a pressure meter to „Sample IN“ fitting
5. Connect test medium supply (N₂ or He) to the pressure meter
6. Supply Analyzer Module with the test medium with a pressure of max. 250 hPa (3.63 psig) and close supply. Since HFID internal it comes to equalization of pressure, supply is to open and to close repeatedly until manometer doesn't show pressure changes.

CAUTION

POSSIBLE INSTRUMENT DAMAGE



The pressure of the test medium must not exceed 250 hPa (3.63 psig) !

7. Watch the manometer.
Over a period of about 5 minutes the pressure drop may not be higher than 7.5 hPa/min. (- 0.11 psig/min.) using Helium (He) or 2.5 hPa/min. (- 0.036 psig/min.) using Nitrogen (N₂).

If the specifications (see table 4-1) were adhered to, then the test is finished.

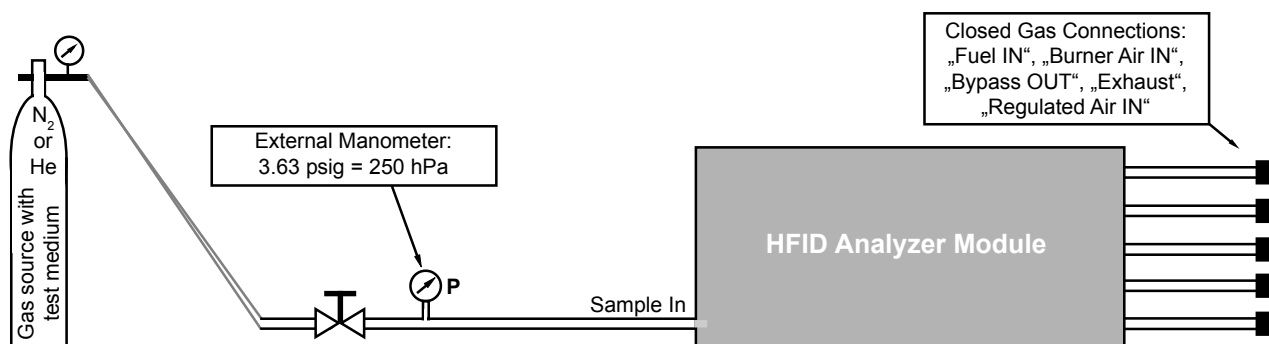


Figure 4-23: Principle Leakage Test Assembly

Test Medium	Nitrogen (N ₂)	Helium (He)
Test Pressure	3.63 psig / 250 hPa / 0.25 bar	3.63 psig / 250 hPa / 0.25 bar
Test Time	5 min	5 min
permissible Drop in Pressure	2.5 hPa (0.036 psig) / min	7.5 hPa (0.11 psig) / min

Table 4-1: Leakage Test Specifications

NGA 2000 HFID

If there is a leakage, then proceed as follows:

a) Using Helium (He) for test medium

- Supply Analyzer Module with the test medium with a pressure of max. 250 hPa (3.63 psig).
- Look for the leak with a helium leak detector.

b) Using Nitrogen (N₂) for test medium

- Supply Analyzer Module with the test medium with a pressure of max. 250 hPa (3.63 psig).
- Liberally cover all fittings, seals, and other possible sources of leakage with a suitable leak test liquid such as SNOOP. Bubbling or foaming indicates leakage.
- Remove the source of leak.
- Perform a leakage test once more as described above.

SECTION 5

TROUBLESHOOTING



WARNING

GENERAL HAZARD

Before starting troubleshooting to this equipment, read the "Essential instructions" on the inside cover and the Safety Summary beginning on page P-2.
Failure to follow the safety instructions could result in serious injury or death.

5-1 TROUBLESHOOTING CHECKLIST

a. Safety System

1. Verify purge supply pressure at bulkhead is between 689 hPa and 1,378 hPa (10 psig and 20 psig).
2. Check case for leaks.
3. Check burner for leaks.
4. Verify purge pressure sensor tube connection.
5. Verify purge out port is vented to atmospheric pressure.
6. Verify Safety PCB connector J2 is attached.
7. Check for a +24V power glitch.
8. Verify that there is no large vibration shock.
9. Check for external leak in purge line.
10. Verify case pressure is greater than 0.5" of water.
11. Check case for over-pressurization.
12. Verify the purge flow/pressure switch harness is routed away from the solenoid valves.
13. Verify the purge timer is counting.
14. Verify purge timer jumper is correctly installed.
15. Verify Internal purge pressure is greater than 380 hPa (5.5 psig).
16. Verify the purge gas switch has been activated.

b. Ignition

1. Verify that the fuel pressure/flow is correct.
2. Verify that the burner air pressure/flow is correct.
3. Verify that the igniter is generating enough heat.
4. Verify the burner exhaust is vented to atmosphere.
5. Verify safety system has been activated.
6. Verify the manual switch is operating correctly.
7. Verify auto-ignite parameters are properly set.
8. Verify burner is properly seated.
9. Verify quality of air supply is good.
10. Verify quality of fuel supply is good.
11. Check burner tip for damage.
12. Check air and fuel restrictor for correct flow.
13. Check burner tip alignment.
14. Verify burner cone is tight.
15. Check burner air and fuel lines for leaks.
16. Verify oven temperature is greater than 85°C (185 °F).
17. Verify the reference thermistor is 100K ohm $\pm 15\%$ at 25°C (77 °F).
18. Verify that there is + 10 VDC to be the reference thermistor.

c. Drift

1. Verify that the sample, burner air, and fuel supply pressures are constant.
2. Check that the sample, burner air, and fuel supply pressures are constant.
3. Verify that the oxygen level in the burner air and sample are constant.
4. Verify the THC level is correct for the burner air and fuel supply.
5. Check that the ambient temperature is changing < 10 K per hour.
6. Verify the burner is clean.
7. Verify temperature of the sample gas, case, burner, and oven has stabilized.
8. Verify the Preamp PCB is clean.
9. Verify atmospheric pressure at burner exhaust is constant.
10. Verify purge gas pressure is constant.
11. Verify burner has been on and stabilized.
12. Check for gas leaks.

d. Noise

1. Check that the burner exhaust is free from water condensation.
2. Verify connection to the collector is correct.
3. Verify connection to the polarizing voltage is correct.
4. Check the ambient temperature is changing < 10 K per hour.
5. Verify the + 24 VDC is clean and grounded properly.
6. Verify there are no strong magnetic fields near.
7. Check for excessive vibration.
8. Verify burner exhaust is vented to a constant atmospheric pressure.
9. Verify bypass line is vented to a constant atmospheric pressure.
10. Verify purge out port vented to a constant atmospheric pressure.
11. Verify the collector wires are routed away from the heater.
12. Verify the collector wires are clean and not damaged.

SECTION 6

REPLACEMENT PARTS

WARNING

UNAUTHORIZED SUBSTITUTION OF COMPONENTS

Tampering with or unauthorized substitution of components may adversely affect the safety of this instrument. Use only factory documented/approved components for repair.

Because of the danger of introducing additional hazards, do not perform any unauthorized modification to this instrument!

6-1 MATRIX

Each analyzer is configured per the customer sales order.

To identify the configuration of an analyzer, locate the analyzer name plate label. The analyzer matrix appears on the analyzer name plate label.

Measuring Range
(Fullscale Range)

Serial Number

Analyzer Matrix



 		
Type: NGA 2000 HFID		SN: 640871234567
THC: FS 10 ... 10000 ppm		
HFID_19_E_3_02_00_2_5	Made in Germany	

Figure 6-1: Name Plate Label

6-2 GENERAL

813344	Fuse, 6A
903107	Fuse, Thermal Cutoff 72° (2 Required - Safety and Power Supply PCB's)
657029	LED Indicator Assembly
656560	LON/Power Module
657413	DC Power Supply Module
657053	Manual Ignite Switch Assembly
657414	Fan Assembly
656943	Electronics Assembly
658350	Computer Board
656945	Preamp Assembly
43500721	Safety Board
655764	Power Supply Board
657060	Sensor Board
656026	Case Temperature Sensor
657094	PROM SW-Version 2.3
659894-R1	PROM SW-Version 3.3.1
659894-R2	PROM SW-Version 3.3.3
659894-RB	PROM SW-Version 3.3.4
659894-R3	PROM SW-Version 3.6
659894-R4	PROM SW-Version 3.7.0
659894-R5	PROM SW-Version 3.7.1
659894-R6	PROM SW-Version 3.7.2
659894-R7	PROM SW-Version 3.9.3
659894-R8	PROM SW-Version 3.9.4

6-3 PNEUMATICS

017154	Filter, .25 DIA x .06 - .09 THK 50-100 Microns (Burner Air)
902832	Regulator 0-60 PSI (Fuel and Burner Air)
657434	Fixed Flow Controller Assembly
023382	Regulator 250 psi
656418	Sample Sensor
871672	Purge Air Regulator
655794	Air Ignite Restrictor
656888	Air Measurement Restrictor
656443	Burner Air Sensor
656444	Fuel Sensor
656418	Flow Control Sample Pressure Sensor
656219	Burner Air 3-Way Solenoid Valve
656218	Fuel In Solenoid Valve
903690	Case Pressure Purge Switch

656533	Purge Air Flow Switch
903728	Regulated Air In Check Valve
903647	Case Pressure Relief Valve

6-4 OVEN COMPONENTS

659551	Oven Assembly 9.7 cc/min @ 3.5 psig
658338	Oven Assembly 2.5 cc/min @ 3.5 psig
657359	Burner Assembly
657205	Igniter Assembly
903736	O-Ring (Igniter Assembly)
657063	RTD Detector
903125	Set Screw M3x0.5 x 10mm (RTD Detector)
657468	Temperature Sensor
657199	Flameout Sensor
903737	O-Ring (Flameout Sensor)
03656580	O-Ring
ETC01463	O-Ring
102260	Air Baffle
657016	Jet Nut
102273	Gasket
657012	Jet Assembly
102256	Gasket
657005	Sample Jet
659614	Thermal Block Assembly
42716459	Spare Part Kit compl. (incl. ferrules) 9.7 cc/min @ 3.5 psig
657486	Capillary, Mixed Fuel (Lo) 9.7 cc/min @ 3.5 psig
42716460	Spare Part Kit compl. (incl. ferrules) 2.5 cc/min @ 3.5 psig
657550	Capillary, Mixed Fuel (Hi) 2.5 cc/min @ 3.5 psig
657061	Sample RTD
659618	Heated Bypass Sample Out Restrictor Assembly - 10 Microns
659615	Restrictor, Heated Bypass Sample Out - 10 Microns
659619	Heated Sample In Restrictor Assembly - 40 Microns
659616	Restrictor, Heated Sample In - 40 Microns
657065	Thermostat 232 °C (450 °F)
659643	Cartridge Heater

SECTION 7

RETURN OF MATERIAL

7-1 RETURN OF MATERIAL

If factory repair of defective equipment is required, proceed as follows:

1. Secure a return authorization from a Emerson Process Management Sales Office or Representative before returning the equipment. Equipment must be returned with complete identification in accordance with Emerson instructions or it will not be accepted.
2. In no event will Emerson be responsible for equipment returned without proper authorization and identification.
3. Carefully pack the defective unit in a sturdy box with sufficient shock absorbing material to ensure no additional damage occurs during shipping.



The completed and signed Declaration of Contamination (page S-2) must be included with the instrument (we recommend to attach it to the packaging outside)!

4. In a cover letter, describe completely:
 - a. The symptoms that determined the equipment is faulty.
 - b. The environment in which the equipment was operating (housing, weather, vibration, dust, etc.).
 - c. Site from where the equipment was removed.
 - d. Whether warranty or non-warranty service is expected.
 - e. Complete shipping instructions for the return of the equipment.

5. Enclose a cover letter and purchase order and ship the defective equipment according to instructions provided in the Emerson Return Authorization, prepaid, to:

In US:

**EMERSON Process Management
Rosemount Analytical Inc.
Customer Service Center
USA: 1-800-433-6076
1-440-914-1261**

In Europe:

**EMERSON Process Management
GmbH & Co. OHG
Service Department Deutschland
D-63594 Hasselroth, Germany
Industriestrasse 1
+49 6055 884-470/-472 Fax: -209**

In Asia Pacific:

**EMERSON Process Management
Asia Pacific Pte Limited
Singapore
+65-6-777-8211**

If warranty service is expected, the defective unit will be carefully inspected and tested at the factory. If the failure was due to the conditions listed in the standard Emerson warranty, the defective unit will be repaired or replaced at Emerson's option, and an operating unit will be returned to the customer in accordance with the shipping instructions furnished in the cover letter.

For equipment no longer under warranty, the equipment will be repaired at the factory and returned as directed by the purchase order and shipping instructions.

7-2 CUSTOMER SERVICE

For order administration, replacement parts, application assistance, on-site or factory repair, service or maintenance contract information, contact:

EMERSON Process Management
Process Analytic Division
Customer Service Center
USA: +1 (800) 433-6076
EU: +49 (6055) 884-470

7-3 TRAINING

A comprehensive Factory Training Program of operator and service classes is available. For a copy of the Current Operator and Service Training Schedule, contact the Technical Services Department at:

EMERSON Process Management
GmbH & Co. OHG
D-63594 Hasselroth, Germany
Industriestrasse 1
EU: +49 (6055) 884-470/-472 Fax: -469

EMERSON Process Management
Rosemount Analytical Inc.
Customer Service Center
USA: +1 (800) 433-6076

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SUPPLEMENT

1 EC DECLARATION OF CONFORMITY

EC DECLARATION OF CONFORMITY

Document number: RAE/HFID-E9

Date: March 2008

We,

Emerson Process Management GmbH & Co. OHG

located at

Industriestrasse 1, D-63594 Hasselroth, Germany

declare under our sole responsibility that our gas analyzer, type

HFID

to which this declaration relates is in conformity with the provisions of:

89/336/EEC EMC Directive (changed by directive 91/263/EEC 92/31/EEC and 93/68/EEC)
with the application of the harmonized standards:

EN 61326-1:1997
+ A1:1998 + A2:2001
+ A3:2003

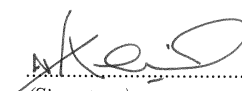
Electrical equipment for measurement, control and laboratory use -
EMC requirements

97/23/EC Pressure Equipment Directive

This analyzer has been designed and manufactured considering article 3,
paragraph 3 of the above mentioned directive and therefore CE marking
does not refer to this directive.

This document covers all HFID modules to be operated with NGA analyzers.

Hasselroth, March 2008


(Signature)

Andy Kemish
(Name)

VP Rosemount Analytical Europe
(Function name)

ROSEMOUNT
Analytical

This declaration confirms the compliance with announced directives but does not include the assurance of properties.
The safety and installation instructions of the documentation have to be followed.








EMERSON
Process Management

2 DECLARATION OF CONTAMINATION

Because of legal regulations and for the safety of Emerson Process Management employees and operating equipment, we need this „**Declaration of Contamination**“, signed by an authorized person, prior to processing your order. Ensure to include it with the shipping documents, or (recommended) attach it to the outside of the packaging.

Instrument details	Analyzer model	
	serial no.	
Process details	Temperature	
	Pressure	

Please check where applicable, include safety data sheet and, if necessary, special handling instructions !

								
This medium was used during	Medium and concentration	CAS No.	toxic	harmful	corrosive	flammable	other ¹⁾	harmless
Process								
Process cleaning								
Cleaning returned parts								

¹⁾ e.g. explosive, radioactive, environmentally hazardous, of biological risk, etc.

Declaration and Sender Data

We hereby declare that the returned parts have been carefully cleaned. To the best of our knowledge they are free from any residues in dangerous quantities.

Company

Contact Person / Function

Address

Phone

Location, Date

Signature

NGA 2000 HFID

Instruction Manual

HAS64E-IM-HW
September 2008

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